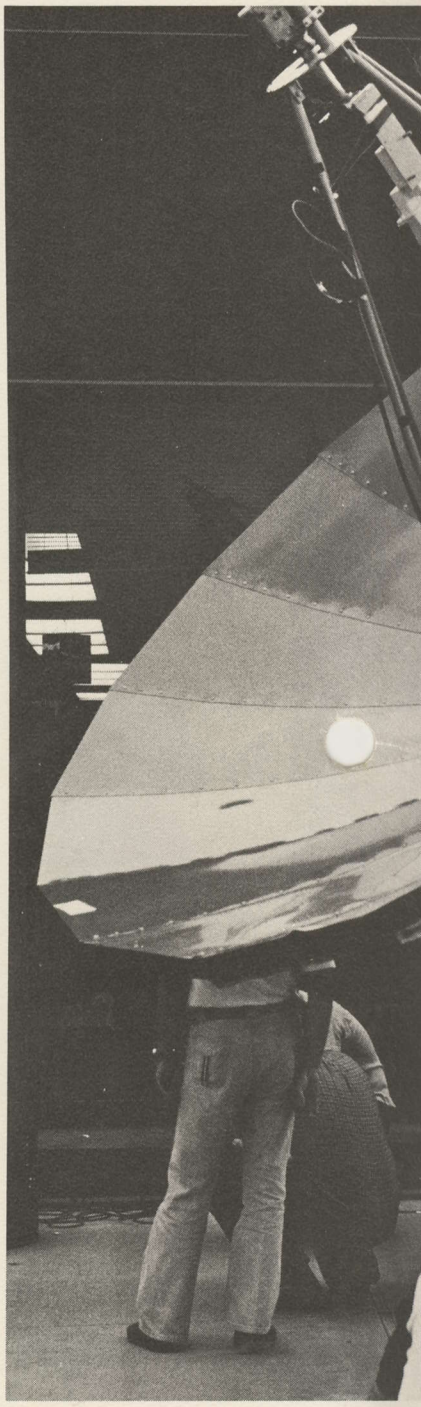
INSIDE THIS ISSUE

COOP'S SATELLITE DIGEST

DECEMBER, 1979

PARAFRAME



MOST-ADMIRED AT SPTS '79 was the PARAFRAME ET/3.66 (12-foot) TVRO antenna. Those who saw us go "cherry-picking" on Day Two won't soon forget the fine reception we got from ANIK-B, while using a 150°K LNA. That's big performance and if you were there YOU SAW IT! For reception photos and product information, write or phone "Mr. Paraframe," Jim Vines.

Paraframe, Inc.
1000 Sunset Drive West
P. O. Box 423
Monee, Illinois 60449 **Phone 312/534-7435**

COOP'S SATELLITE DIGEST T1-12/79

COOP'S COMMENT ON TECHNOLOGY

THE DOWNLINK SPIRAL

The hardware market for 'small' (or 'low-cost' or 'home') TVRO terminals is in a period of considerable adjustment. The trend is downward, but the direction of travel is faltering, halting from time to time as new innovations come along to temporarily push the 'base pricing schedule' back up again.

Fellow technologist H. Paul Shuch and I were talking one day late in October. **"Why don't you plant a controlled 'leak' in CSD telling people you think there will be $1,000 home receivers on the market by mid 1980?"** asked Paul. It happens I agree with Paul that this price range is certainly feasible by say 12 months from now, but I'm not sure the market is ready for that kind of bottom-line pricing just yet. It may be that the engineers are working overtime and in doing so they are outpacing the marketeers.

The average man in the street has no idea what satellite television is. In spite of my own prolific writings we've hardly scratched the surface yet. Satellite TV is hardly a household word.

Chuck Colby at Microwave General tells me that their $9,900 turnkey installed super deluxe terminal systems are selling better than their $6,900 bread and butter terminals. "The people who have that kind of extra money hanging about are not quibbling over an extra $3,000; they want a terminal with all of the bells and whistles" notes Chuck. I think he's right. The marketplace today is the 'video nut'; the individual with lots of disposable income who views a private (home) satellite terminal as just another expensive space age toy. This chap probably already has a couple of home VCRs, a wide screen system, a home color camera and loads of peripheral gear. He is looking for the 'ultimate video experience' and he hopes that satellite TV will be it. Microwave General's super terminal with easy chair operated remote control of the antenna's azimuth, elevation and polarization rotation gives him access to everything in the sky. **This customer** is not going to be satisfied with anything less.

The missing ingredient is marketing. Manufacturers of small terminals are typically smallish companies with a handful of employees all wearing two or three hats. There is very little professionalism in the market (few indeed even have advertising programs) and very few even understand the distributor/dealer system. Their fame spreads largely by word of mouth which was fine in ancient Rome but hardly adequate today. The exception to this statement is Scientific Atlanta's HOMESAT division and to some extent Cliff Gardiner's multi-layered Houston operation. But even with these two exceptions, there is not the kind of national, razz-ma-tazz marketing that one would expect from Sony, or Panasonic or Channel Master or Winegard.

So to this point the 'market' is not even price conscious because by and large the market is not yet aware of the product's availability. Or the service itself. There is a large amount of spade work to be done here and perhaps through some mutual efforts those suppliers with an interest in making the market more viable will spend some time discussing this in a mutual way during SPTS '80 in Miami; come February.

In spite of the lack of awareness and marketing appeal (or the appeal **of** marketing), Paul Shuch is probably correct. A $1,000 receiver is certainly possible by this coming summer. The germ for it already exists. You take Robert Coleman's one or two stage GaAs-FET front end (the ultimate decision between one and two stages is yet to be made), marry that to Coleman's active mixer that produces a 70 MHz i.f. and then jump horses to the latest Tay Howard 70 MHz i.f. strip and video/audio demod circuits (see Technical Section of this issue). There are three or four expensive components here; the GaAs-FET (2 or 3 required) and the VTO-8360 VCO. Both items will drop in price sharply the first time some substantial company waves a 10,000 per annum purchase order in the right direction. A $40 GaAs-FET and a $50 8360 are certainly practical at that quantity level; and the balance of the full receiver will cost far less than the combined costs of the GaAs-FET and VCO parts. Additionally, there is nothing to cause either pricing to freeze at the 10,000-per-annum level; $20 GaAs-FETs and $20 VCOs in the 100,000 per annum region are distinctly possible.

None of this will happen in a short cycle however. Before any 'substantial company' will make this type of commitment, there will be 'water testing' and 'market exploration' with smaller quantity, higher priced packages. Even **after** the decision is made, there is the inevitable turn around time while GaAs-FET and VCO suppliers learn how to move from 100 per week to 100 per hour production rates.

So while H. Paul Shuch may well be correct that **engineers** will be ready to produce $1,000 end user price range receivers by this coming summer, we seriously doubt the balance of this new, fledgling industry will be ready to manufacture or market them. On the other hand things tend to happen very fast in this business and as Tay Howard likes to note "everything is on pins and needles waiting for the first BIG buy". When it happens, all of the rules of the game will change and the home satellite industry will be off and running in a big way.

CSD TECHNOLOGY

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RCA FIII and COMSTAR

NEW BIRD FORMATS

A stage of transition is rapidly approaching the North American domestic satellite services. RCA's third (FIII) bird is scheduled for launch from Florida's east coast launch area about the time you read this material and while this third 24 transponder RCA satellite will increase by more than 50% the actual RCA transponders available for operation, the three ATT/GTE operated COMSTAR birds located at 128, 95 and 87 degrees are taking on new importance in the scheme of things as more and more video shows up on these formally non-video birds.

Starting in this issue of **CSD** in the Programming Section readers will find a listing of transponders in use for video services on all of the North American domestic satellites. This information, supplied by terminal operator/readers, is designed to assist you in your own equipment alignment and maintenance.

While RCA FIII is scheduled for launch early in December, the mystery as to which service will actually be operating on what transponder continues. RCA is understandably reluctant to release such information until FIII has achieved geostationary orbit and completed initial flight check outs. This suggests that perhaps before the January **CSD** goes to press, but in any event a month or more prior to the actual activation of FIII, this information will become available; and we'll have it here for you at that time.

THE FACTS

RCA's FIII is the same generation satellite as the present FI and FII birds. A 10% increase in battery capacity (over FI and II (plus a small similar increase in hydrazine fuel kept on board for manuevers during the life of the satellite are improvements made to the system. Additionally, RCA has retro-fitted the FIII bird so that there are four in-place 'spare' TWT (traveling Wave Tube) amplifiers on board. There spare output stages are configured so that by ground command they can be remotely switched into operation to replace short-life TWT's that may develop on FIII as time goes on. RCA talks in terms of a seven to ten year life for FIII, up perhaps 25% from similar estimates of FI and FII life prior to their launches.

Neither FI nor FII are operating at full capacity. On FII, where the first heavy concentration of cable programming began in 1976, transponder 12 has been defunct for quite some time and others have shown signs of erratic behavior. **FII** has had a solar panel tracking problem from the day it was launched and to this day RCA engineers continue to 'hand crank' the solar panel backwards through a 340 or so degree rotation once per day to avoid a 'high friction/torque' zone on the solar panel rotation system. FII has also exhibited erratic attitude problems on several occasions; the most recent being this past September when the bird decided to seek its own boresight and failed to respond properly to earth uplink commands properly for a short period of time. **FI** has apparently had a defective transponder 4 from the day it was launched; transponder 13 is either dead or so erratic as to be not usable. There have also been some TWT problems with FI with unexplained reductions in downlink transmitter from time to time on several transponders.

FIII is to be known formally as "the cable TV bird". With 24 brand new transponders and a back up of four extra TWT output stages, FIII is prepared to provide the cable industry with no fewer than seven and perhaps as many as ten years of service. FIII will locate at 132 degrees west. All RCA SATCOM birds employ multiple up and downlink antennas on the bird. RCA groups transponders by sets of six channels per transmit antenna and the theory has been up to this point that the four separate transmit antennas (on FI and FII) could have slightly different boresight ptterns to favor transmission to various portions of the North American area. For this reason some transponders (on FI) have stronger signals into your area than other transponders on the same bird. The most varied boresight patterns are found on FII where one set (3, 7, 11, 15, 19 and 23) is so skewed that it is of no real value east of the Rockies (Chicago is lower than 30 dBw).

Most people expected FIII to follow that format but RCA's official data on file with the FCC suggests they have other plans. **See map number one.** This map is for **all four** of the antenna sets according to the Commission filed data; there is not expected to be any wide (if in fact measureable) difference between the various antenna/transponder sets with FIII. Now how does this **projected** EIRP contour stack up against the present service levels from FI?

FI data is perhaps the best of all domestic satellites to date largely because the computed data initially made available by RCA has been refined through an elaborate series of field tests and extensive 'modeling' by COMPUCON. Compucon feels the real-world boresight for FI and the respective boresight levels are as follows:

Antenna Set One
(Transponders 2,6,10,14,18,22)
a)Boresight approximately Ft.Dodge, Iowa
b)Maximum EIRP at boresight/ + 34 dBw

Antenna Set Two
(Transponders 1,5,9,13,17,21)
a)Boresight approximately Watertown, S.D.
b)Maximum EIRP at boresight/ + 35 dBw

Antenna Set Three
(Transponders 4,8,12,16,20,24)
a)Boresight approximately Watertown, S.D.
b)Maximum EIRP at boresight/ + 34 dBw

Antenna Set Four
(Transponders 3,7,11,15,19,23)
a)Boresight approximately Rapid City, S.D.
b)Maximum EIRP at boresight / + 35 dBw

These values are from 1 to 2 dB **lower** in the real world than RCA had previously predicted and of course this lower margin has been apparent on many marginal systems.

The data shown in Map Number One is of the same 'generation' as the earlier FI data that had most of us **expecting** 36 dBw contours over wide areas of the U.S.A. Note that the boresight is pulled slightly west and south and RCA is suggesting that with a fully peaked-out system they expect to put around 36.7 dBw into the boresight region.

Of particular note in Map One is RCA's **hope** that areas such as southern Florida will see EIRP's in the 33 to 34 dBw region; a portion of the country where present FI service suffers in the 30 to 32 dBw range. Picking up three (or even two) dB in this portion of the country is going to help many marginal systems. Another area suffering from a combination

RCA VERNON VALLEY - all three RCA satellites will be largely flown from this uplink and control center site. A similar site at South Mountain [California] completes the control network for ranging purposes.

of low look-angle (i.e. elevations close to the horizon) **plus** questionable EIRP levels has been New England. FIII promises to be slightly hotter (perhaps 0.5 dB) than most of the FI transponders in this region. The balance of the rest of us should do about the same or a tad better than with FI; **provided** the 'predicted' contours on file by RCA turn out to be the real world contours after launch and positioning of the bird. Alas, Alaska looks like it may suffer; especially in the Anchorage area west where EIRP's in the 28 dBw (and down) region will replace present levels in the 29 to 30 dBw region. On the opposite side of the service region, Puerto Rico and other islands in the western an mid-Caribbean **may find** FIII as much as 2 dB hotter than FI.

CSD would like readers to work out some local system for measuring the **relative** signal levels on each transponder for FI. Start recording these levels on a daily basis, varying the time of day each consecutive day if possible. Develop average readings (off of the receiver i.f. or some other non-AGC'd point) and then when FIII is operational (probably in February) we'll ask you to make similar transonder by transponder checks on FIII. By collecting all of the data here we should be able to develop a fairly accurate set of 'better than'/'worse than' maps in short order. In this way we'll all be able to participate in a national (or continental) effort that will establish some guidelines for the next generation of terminal builders.

FIII will also have a separate offset spot beam to provide coverage to Hawaii. RCA refers to this set of antennas as ''Antenna Beams 5 and 6''. They are physically offset from the main antenna reflectors, smaller in size, designed to 'squirt' some amount of signal to the Pacific Island state. The boresight EIRP for the two Hawaiian antenna patterns is 27.5 dBw and there is one vertical set and one horizontal set of antennas involved. The transponders to be squirted to Hawaii on FIII are:

1)Antenna set 5 - transponder 2,6,10,14,18,22
2)Antenna set 6 - transponders 1,5,9,13,17,21

For reference the Hawaiian FI spot beam transponders are the same as on FIII. Basic FIII operational parameters appear here separately.

THE COMSTAR CHANGE

When COMSTAR's DI bird was first launched in 1976 the bird was to be utilized only for telephone and message (data) traffic. All three of the COMSTAR birds are leased by AT&T/GT&E and are actually owned by COMSAT. These are twenty four transponder birds (alternate vertical and horizontal channelizations) not unlike the RCA SATCOM series. Physically they are larger than SATCOM and require more elaborate launch facilities. The FCC permission for the telephone giants to enter the 'domestic satellite business' was conditioned on these birds not being utilized for video (and some descrete other) purposes any earlier than 1979. The FCC at the time believed that WESTAR and SATCOM were going to have a tough-enough-time attracting users (and therefore revenue) to their domestic birds without competition from the telephone giants. So an agreement was made whereby the telephone birds could launch provided they stayed out of the domestic video business. This agreement ran out this past July and now the COMSTAR birds are 'free' to engage in the video marketplace right along with WESTAR and SATCOM.

The COMSTAR locations are spread throughout the orbit belt with DI at 128 degrees, DII at 95 degrees and DIII at 87 degrees. DIII, the most recent to launch (this past June after a mild fuss with the FCC), has been observed of late carrying a fair amount of video traffic. Other viewers report video on COMSTAR DII (95 degrees).

SATCOM FIII BASIC DATA

Satellite Owner/Operator: RCA Americom
Nominal Location: 132 degrees west
Expected Launch Date: December 07, 1979
Expected Operational Date: February 1980
Coverage Area: Continental 48 plus Hawaii, Alaska, Puerto Rico and Virgin Islands
Uplink Band: 5.925 to 6.425 GHz
Downlink Band: 3.7 to 4.2 GHz
Downlink Beacons/Data: 3,700.5, 4,199.5 MHz
Beam Pointing Stability: + /-0.26 degress
Transponder Format: 24, 12 vertical, 12 horizontal
Types of Carriers:
a)**972 channels FDM/FM in 34 MHz**
b)(FM) TV; 1 channel in 34 MHz with 2 MHz peak to peak energy dispersal
c)**1.544 Mb p/s [40 PSK] data, 1.29 MHz wide**
d)25.7 KHz FM audio, 276 channels per transponder

24 TRANSPONDER SPACE TO EARTH ASSIGNMENTS [FIII]

Center	Transponder Band	Polarization	Antenna Set
3,700.5 - Beacon, telemetering downlink			
3,720	3700-3740([1]	V	2 (6)
3,740	3720-3760[2]	H	1(5)
3,760	3740-3780[3]	V	4
3,780	3760-3800[4]	H	3
3,800	3780-3820[5]	V	2(6)
3,820	3800-3840[6]	**H**	**1[5]**
3,840	3820-3860[7]	V	4
3,860	3840-3880[8]	H	3
3,880	3860-3900[9]	V	2(6)
3,900	3880-3920[10]	H	1(5)
3,920	3900-3940[11]	V	4
3,940	3920-3960[12]	**H**	3
3,960	3940-3980[13]	V	2(6)
3,980	3960-4000[14]	H	1(5)
4,000	3980-4020[15]	V	4
4,020	4000-4040[16]	H	3
4,040	4020-4060[17]	V	2(6)
4,060	4040-4080[18]	H	1(5)
4,080	4060-4100[19]	V	4
4,100	4080-4120[20]	H	3
4,120	4100-4140[21]	V	2(6)
4,140	4120-4160[22]	H	1(5)
4,160	4140-4180[23]	V	4
4,180	4160-4200[24]	H	3
4,199.5 - Beacon, telemtering downlink			

Because we are dealing with three birds and each bird has four separate downlink antennas, as you might suspect there are many antenna patterns involved. Basically all of the D series satellite data **on file at the FCC** indicates that there is a great deal of similarity between each of the three satellites. For example:

Antenna Set One
(Transponders 1,5,9,13,17,21)
a)Boresight typically in center of continental U.S.A. (called CONUS)
b)Maximum EIRP typically in the 34.5 dBw region
See COMSTAR D-I **Map Number Two** here; also COMSTAR DIII **Map Number Three** here.

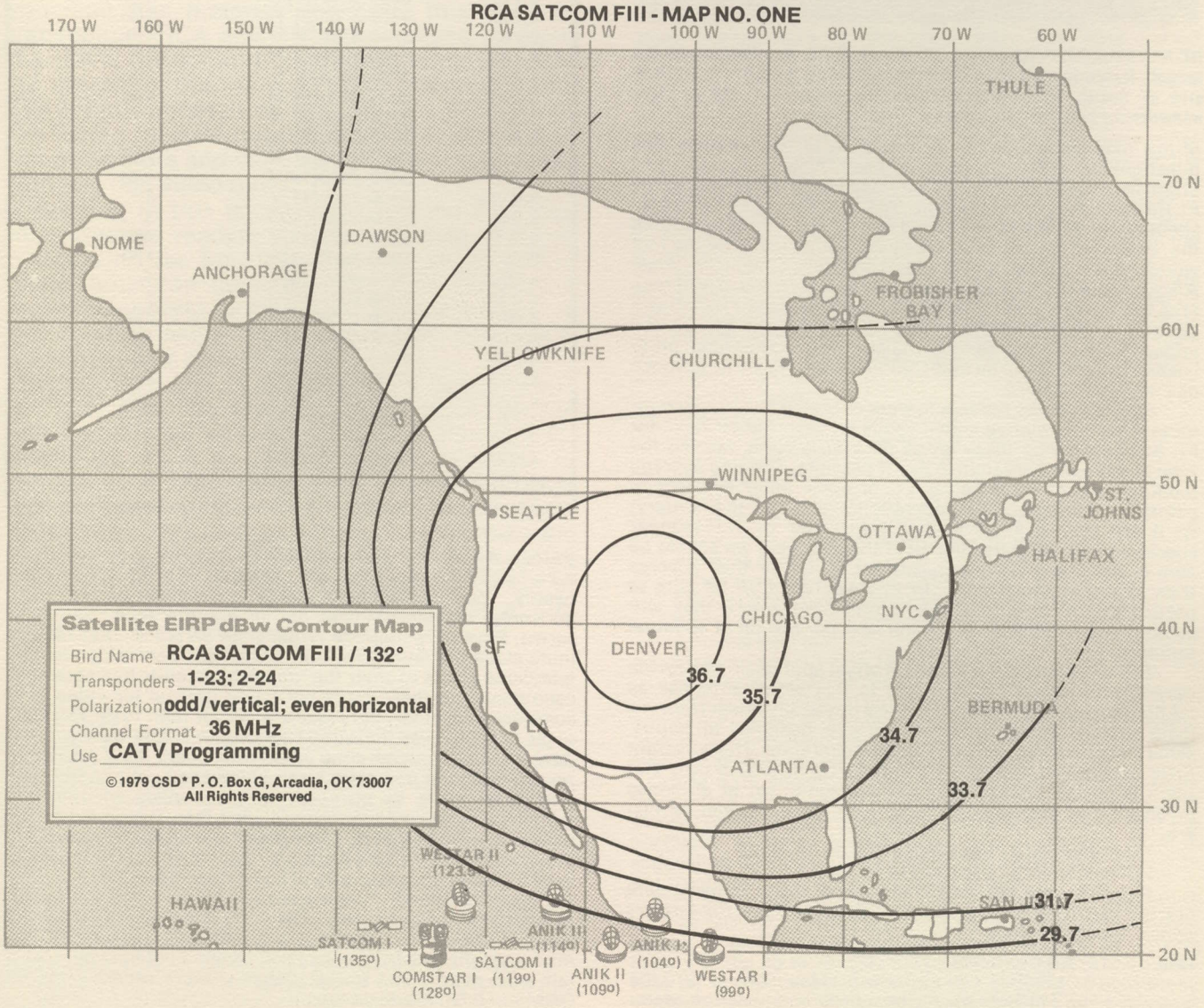
Antenna Set Two
(Transponders 3,7,11,15,19,23)
a)Boresight typically on Alaska with rapid fall off on CONUS; San Francisco down 12 dB on DI for example, 9 dB on DII. On DIII the Alaskan beam is above the horizon (i.e. it does not reach Alaska because of the far-eastern location of DIII at 87 degrees).
b)Maximum EIRP typically in the 34.5 dBw region.

Antenna Set Three
(Transponders 2,6,10,14,18,22)
a)Boresight on Hawaii with a rapid fall off towards CONUS. On DI, for example, Los Angeles is down around 14 dB, on DII Los Angeles is down 10 dB and on DIII also down 10 dB. DI has a 2 dB down contour west of Hawaii as far as approximately 170 degrees (and 10 north).
b)Maximum EIRP typically in the 34.5 dBw region.

Antenna Set Four
(Transponder 4,8,12,16,20,24)
a)Boresight in Caribbean just west and south of Puerto Rico with the 2 dB down region covering virtually all of the Caribbean, Central America and along much of the coast of northern South America. See **Map Four** here for a comparison between the western most COMSTAR (DI) and the eastern most COMSTAR (DIII). Gradual fall off towards CONUS with the Gulf Coast area down 6 dB (typically) while Kansas City is down 9 dB on DI, 15 dB on DII and 17 dB on DIII.
b)Maximum EIRP typically in the 34.5 dBw region.

Because the COMSTAR birds are closely related to the INTELSAT system through the COMSAT ownership, and because the telephone giants have their own way of doing things, the video that is beginning to show up on COMSTAR is largely without subcarrier audio. Several observers who have found as many as six channels of video up simultaneously have yet to hear any companion audio. One observer does report

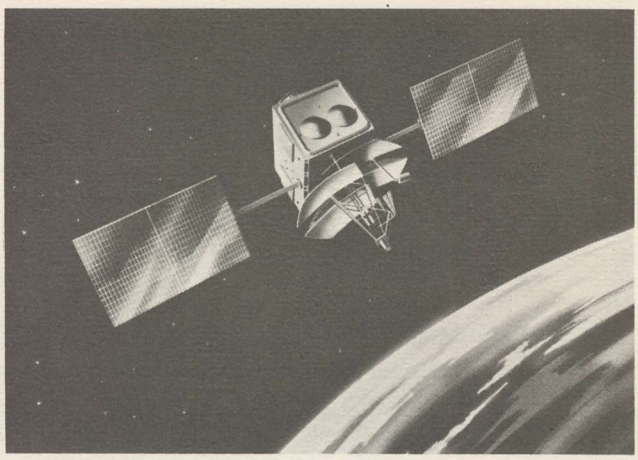
RCA SATCOM FIII - MAP NO. ONE



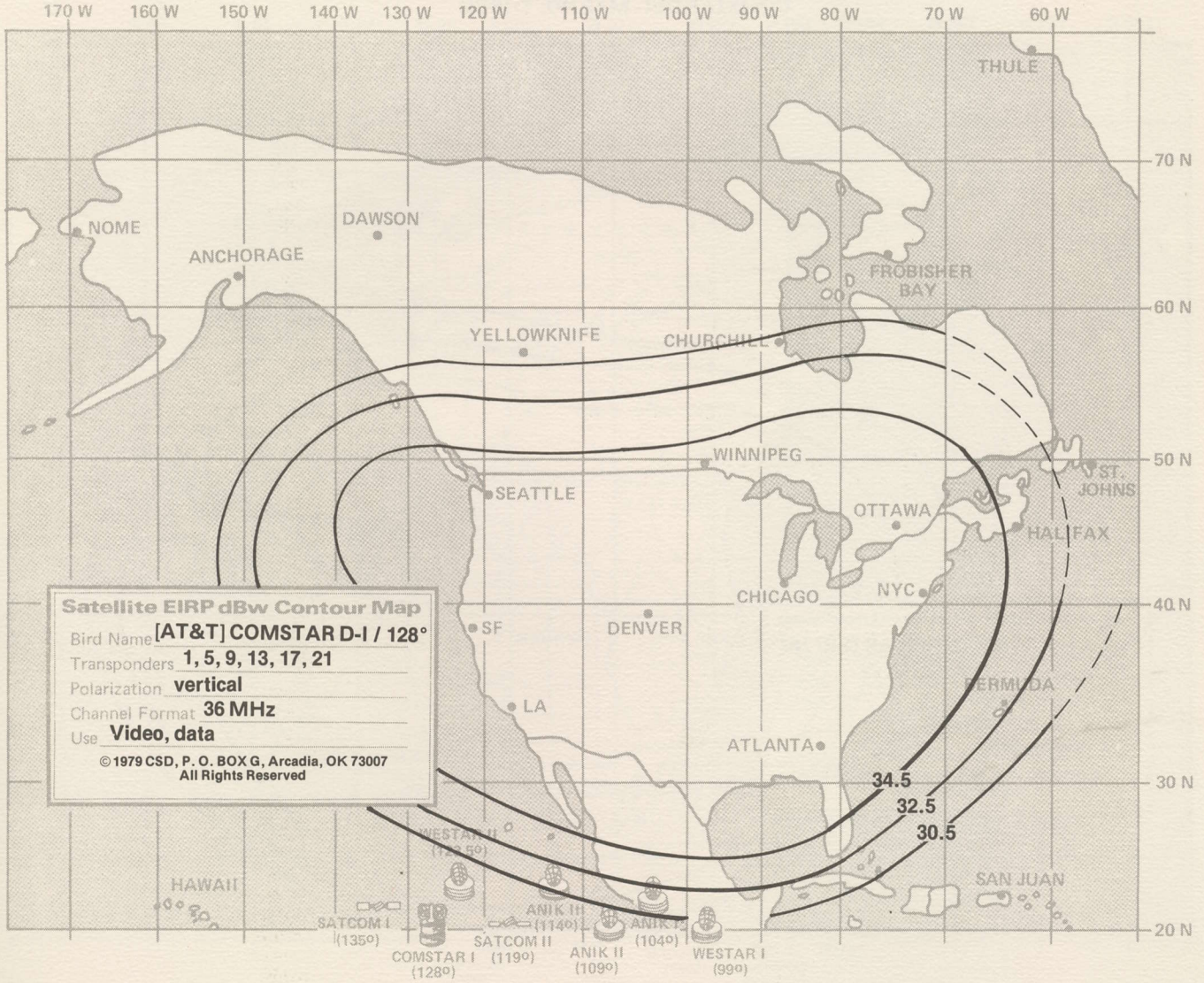
hearing occasional 6.8 MHz 'cue circuit audio' (instructions from the transmitting station to the appropriate receiving station) on one of the DIII video transonders but no program audio. So where is it?

In the INTELSAT scheme of things virtually all audio is transmitted via a separate transponder (from the video) using SCPC (Single Carrier Per Channel) techniques. There has been some (growing) use of 6.6/6.55 MHz as an aural subcarrier frequency in some INTELSAT circuits however and one would suspect that ultimately the somewhat inefficient technique of stripping the companion audio off at the transmit uplink station and sending it through another totally different transponder would be less and less in vogue. In the meantime if you are tuning in video from COMSTAR and cannot find audio (6.6 or 6.55) chances are you will have to go looking on one of the transponders on the same antenna set (thereby indicating the same footprint), with an SCPC receiver.

Several Caribbean area viewers report that the three U.S. commercial networks have been observed on DIII from time to time but apparently not yet on a routine or scheduled basis. COMSTAR will be 'worth watching' in the coming months as the telephone firms operating these birds get their feet wet with marketing in the video area and begin to come up with regular customers for their services. Observer reports will be welcomes for **CSD**'s 'Tuning In The Birds' portion now carried on a regular basis in the Programming Section.



COMSTAR DI - MAP NO. TWO



TECHNICAL CORRESPONDENCE AND NOTES

ANOTHER SUPPLIER?

Let me start by thanking you for the words you printed in your October CSD about my company and our 10 GHz Video Transceivers. As a result of that mention we've had several direct sales for units and several more inquiries. Also, we are currently developing 'low cost' TVRO system for consumer use. I ahve been doing a lot of research into this matter and as an OEM manufacturer I feel we can produce, in quantity, a system that will fit the average consumer's budget. We are a small company with ten employees but expanding and I'm dedicated to producing low cost amateur and commercial communications equipment such as the TVRO gear as well as the TVX10 10 GHz transceiver. I look forward to attending SPTS '80/Miami!

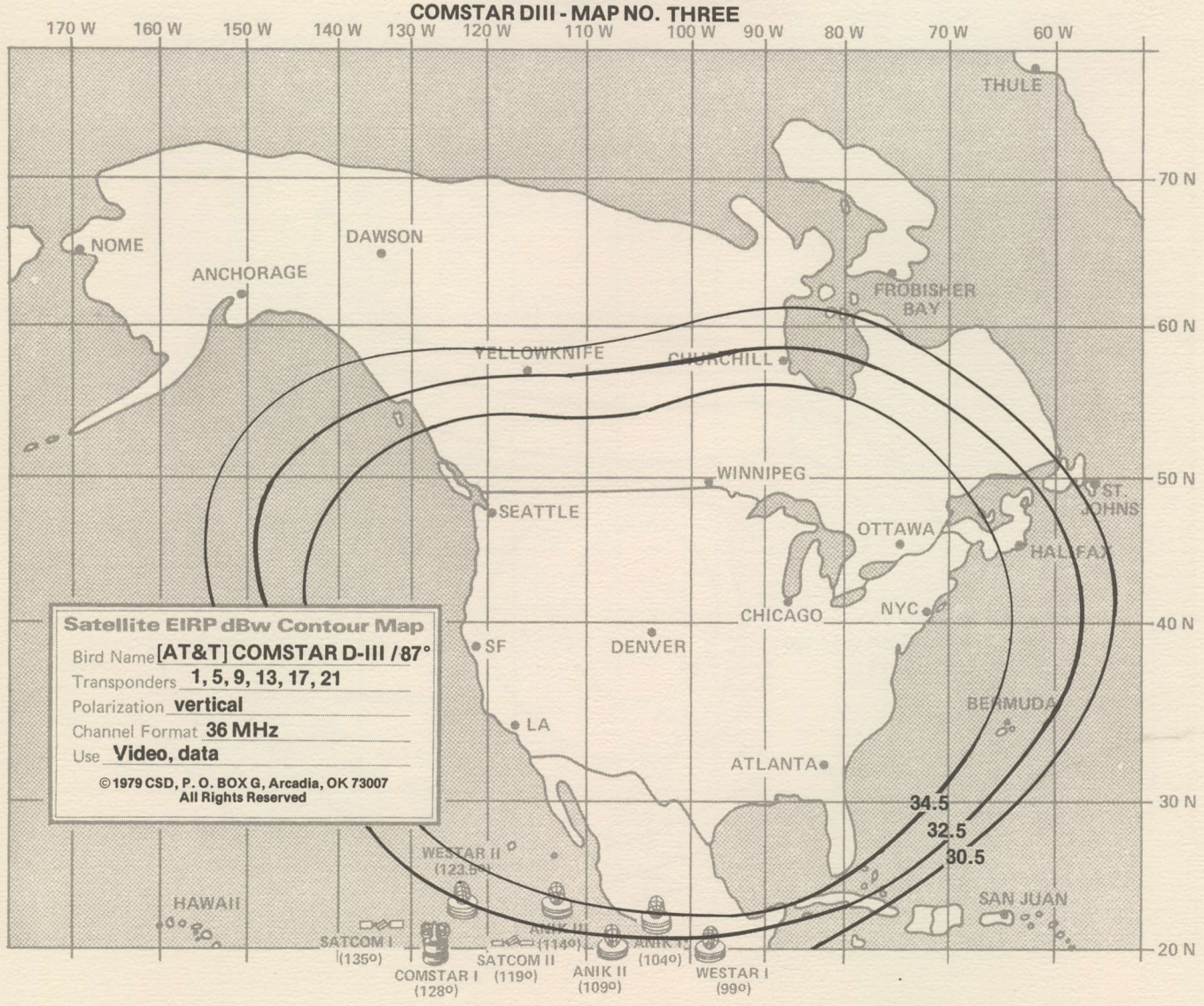
C. E. Green, President
TCI, Inc.
411 N. Buchanan Cr., #13
Pacheco, CA 94553

Green's firm manufactures a low cost [approximately $350] 10 GHz video [plus audio] complete transceiver ideal for short haul [up to ten miles with suitable dish antennas] baseband interconnects. Welcome to the TVRO world at TCI; we need more innovative suppliers!

ORANGE PEEL ANTENNA?

I was wondering why the old radar/Airforce trick of mounting the mixer plus i.f. at the feed of the antenna wouldn't work better than the seemingly more complex system of hanging an LNA out there and then piping that hard to

COMSTAR DIII - MAP NO. THREE



replicate 4 GHz energy down expensive coax? Also does anyone happen to know where I might locate 'height finder' Orange Peel antenna such as it used in the 2 GHz range? I've got the feeling that one of those would make a good start on an antenna system here.

Robert A. Collings
Box 434
Stettler, Alberta
TOC 2LO Canada

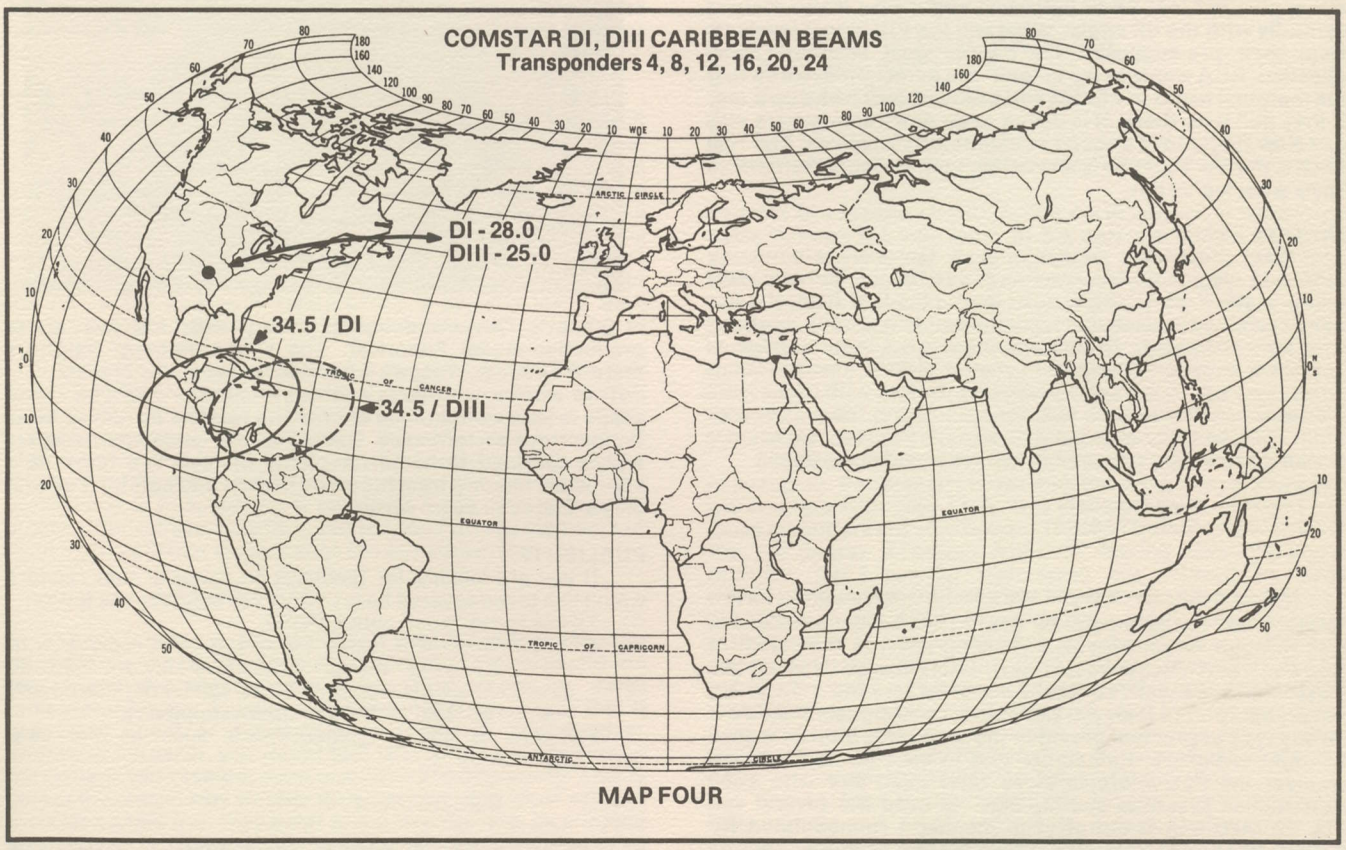
There is nothing wrong with converting to the 70 MHz i.f. at the antenna; nor with converting to a high i.f. such as 1,200 MHz [for a double conversion receiver] there was well. Robert Coleman's low-cost approach does just that. However, as Tay Howard points out the more electronics you have at the feedhorn the greater your 'opportunity' to climb a ladder and repair or replace something, or tweek, during poor weather. Bob Coleman has also learned that the Avantek VTO 8360 VCO source, mounted outside at the feed in a container, is somewhat less stable when there are wide temperature extremes than it was this past summer when the weather hovered in the 70-90 degree range. Coleman's working on a solution to this but anyone expecting to simply hang it in a box at the feed and remotely tune the system with the 8360 tuning voltage should be prepared to do some tweeking as the weather changes and it gets cooler. We can picture the 'Orange Peel' antenna in our mind and in a sense it is a one-dimension Spherical. Whether it would have sufficient gain at 4 GHz is another matter. Anything less than around 40 dBi is marginal.

A COMPLETE KIT?

I would like to know if I can buy a completed kit to receive the signals from the satellites? I intend to use a Jim Vines 16 foot parabolic and would like to acquire a receiver like that shown on the inside front cover of the Howard Terminal Manual.

Joe Cotic
Cassiar, B.C.
Canada

A complete kit is called a factory assembled unit. The closest thing to the Howard Terminal receiver in the commercial [off the shelf, ready to plug in and turn on] field is the International Crystal Mfg. Company [ICM for short] TV-4200. This receiver has a list price of $1995 and it follows closely the Howard Terminal [do it yourself] receiver design. The 4 GHz to 70 MHz portions [converts to 1200 MHz region for high i.f. and then to 70 MHz for low i.f.] is ala Paul Shuch's Microcomm modules. The 70 MHz i.f. to baseband portion is straight Taylor Howard. To our knowledge, this is the least



MAP FOUR

expensive receiver [built and aligned] on the market today. ICM's addres is 10 N. Lee, Oklahoma City, OK 73102. Now as for kits...bit by bit, they are coming along. Robert Coleman's 4 GHz LNA is not yet kitted but you can buy the boards and the chips from him. Same applies for his active GaAs-FET mixer and VTO 8360 LO source. That gets you down to 70 MHz. We expect in either February or March issue to tell you about a complete 70 MHz i.f. strip [amp] and a 70 MHz to baseband demodulator system that will be available as a kit. It IS getting easier all of the time!

WHAT ABOUT CONNECTICUT?

Will a ten foot dish give a high quality picture in Connecticut? A number of people tell me yes; others say positively no. If the answer is no, what is the minimum size that will give a good picture here? Is there any truth to the rumor that RCA's new SATCOM FIII will place an even lower signal level into New England than FI now does?

Melvyn Shank
Master Antenna Systems, Inc.
Orange, CT 06477

If you are considering FI or FIII reception, a ten foot dish in any **portion of new England would be marginal. The problem is not signal level; as much as it is the low look angle** (i.e. the satellite is down close to your horizon; Boston is 9 degrees to FI where it is now and will lose more than another degree when FI relocates to 136 degrees west). **Low look angles are 'noisey' because the earth terrestrial noise** (which is a 290 degree K noise source at best) **begins to show up on the antenna sidelobes** (unless you are very clever and careful with controlling side lobes on the feed antenna). **The minimum size recommended for New England is a 12 foot antenna** (parabolic) **although a ten foot Swan Spherical might play if you worked carefully with the tilt angle. What will the FIII signal levels be from their pre-supposed 132 degree west location? Good question. RCA wants to try to 'pull' the boresight down so that the marginal levels in Florida and the Southeast come up a tad. If they pull it up there, it is bound to go down somewhere else and New England is as good a candidate as anyplace. The real truth is that AFTER FIII is on station, then and only then will be know what we've got.**

INDOOR TVRO?

I am interested in building a low-cost satellite TV receiving system. Can an antenna of 8 to 10 foot diameter work inside of the room where I live? I live on the first floor of a two story rooming house with a big window facing to the west and another to the north. In this city there are a large number of casinos a few blocks away.Will their FM VHF transmissions which they use for security purposesinterfere with my satellite TV reception? How much skill for assembling the unit in your plans can be acquired 'on the job'. I do have experience working in electronic assembly and I can read blueprints.

Paul Lansdale
Reno NV 89501

Inside is out. Even if you were fortunate enough to have a 'big window' [large enough for the full 8 to 10 foot parabolic to look through without occulsion] facing towards the satellites [you don't as it is southwest of you], 4 GHz energy does not like glass windowpanes. The loss is not great [around a dB or so] but probably more than you can stand. Local signals should not be any type of problem provided the receiver is built in a good RF-tight enclosure. Remember that in the Howard Terminal receiver the PLL operates at 70 MHz itself and with good construction practices you manage to keep the several volt PLL 70 MHz signal out of your channel 4 re-modulated RF output. So a puny local signal should not be a problem. Yes, we think anyone who is half talented can build the Howard Terminal. Coleman's approach requires more background in electronics, assuming you are willing to tackle Robert's designs. If you decide to move to a rooming house with a large southwestern exposure we'd love to have a photo of your ten foot dish mounted inside your home. Now THAT would be a conversation piece [psst young lady...would you like to come up to my room to see my ten foot...dish?).

OLIVER S. REVISITED

Enclosed are some photos of the Swan five meter Spherical antennas now being manufactured in California. Gardiner Communications sent a man here from DALSAT to check the antennas operation parameters. He said that the overall gain was just slightly less than a parabolic of the same size. We made a polar plot and found there were no sidelobes detectable above -30 dB. The cross-pole characteristics were better than FCC requirements.

Oliver Swan
Swan Antenna Systems
200 Swan Rd., RR #1
Bisbee, Arizona 85603

That's Oliver's daughter Penny with the five meter production-model Spherical. The whole antenna weighs a mere 375 pounds. Yes, we know it looks round (as in parabolic) **but we** assure you **this is a true Swan-Spherical! The round shape is for a combination of practical reasons including noise temperature performance. Oliver recently underwent surgery and is confined to home for plenty of rest. We think he'd appreciate hearing from his many friends and admirers even if only a** 'Get Well Soon' **card.**

PUBLISH IT

If you are looking for feedback on material that readers would like to see covered here in CSD, my suggestions follow:

1) How to get 'legal' with a TVRO.
2) How to become a 'cable TV system' and register with the FCC even though you have fewer than 50 subscribers (this way your TVRO can be registered and you can be legal with the program suppliers).
3) Where to get component parts such as the chip capacitors.

Bernard Dunn

We are always looking for suggestions on materials to publish. Getting 'legal' is now a cinch. Just build it, and when the FCC finally figures out what they want from you in the form of a registration form, send it to them. And get permission [or contracts] from the program suppliers as well. We will cover in detail how to set up a small, under 50 subscriber, CATV system [so you can re-coup some of your TVRO investment by hooking

up homes in the area for a fee] in our February CSD. It is a good idea who's time has come. Every issue has lots of component parts sources. Anyone who is having trouble finding parts, still, should drop a a line. We'll try to help. If you want a direct answer to ANY question, enclose a stamped, self addressed envelope to speed things up here.

DATA, DATA, DATA

Have been following with interest the first three parts of your series in RADIO ELECTRONICS. How does one go about finding the specific frequencies of individual companies, TV network feeds, etc? I am interested in the remote STL as well as the satellite frequencies. Are there not a great many other satellite frequencies other than the 3.7 to 4.2 GHz band? Can these other satellites be picked up with some modifications to the basic 4 GHz receiving equipment? I am also quite interested in being able to receive terrestrial microwave hops.

Ronald A. Levinson
St. Louis, MO 63132

Yes, there are several other active satellite bands. However, none at the moment [other than the 11/12 GHz downlink band] have video or public audio on them. We will be starting to feature a 11/12 GHz receiving system for INTELSAT and where applicable [such as in Canada] the new Ku band transmissions very shortly. English system designer Steve Birkill, who starts with us this month as a regular feature writer, has promised to share the construction details of his 11/12 GHz satellite receiving system. During the next year as the INTELSAY V birds become operational, there will be plenty of 11/12 GHz video available. Reception from other satellite services (largely operated by the military) **is kind of out of our bag. And the same applies to reception of the terrestrial STL and other private hops in operation; at least for now.**

NOISE TEMP AND 'DETECTORS'

I have been reading the series in RADIO ELECTRONICS and have a few questions. In Table 1, page 85 for R-E October you indicate the noise temperature of the amplifier used in the preamplifier portion of the system. Clearly a larger antenna means more signal going to the 'detector' meaning that with a larger antenna, you can get by with a larger noise figure as well. The chart indicates this to be true. However the chart indicates for the smaller sized dishes that the LNA must be in the 100 to 200 degree K range which is actually lower than room (earth) temperature. Is this possible without going to liquid nitrogen cooling?

I assume the parabolic dish acts as a reflector and the dish shape is independent of frequency. It seems to me that the dish is the most complicated (and therefore expensive) part of the system. It is not clear to me why this technique is used. It seems to me you could build a flat 'detector', of the same aperture as the dish, and achieve the same results without the complications of achieving a parabolic curve. Could you not create a flat reflector surface and suspend driven elements in front of the reflector surface such as I have drawn here?

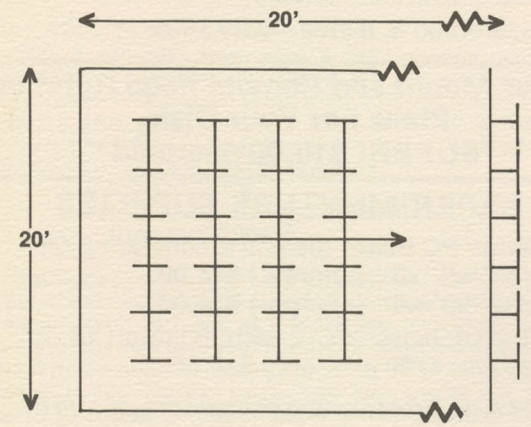
Brent Bardly

There is considerable confusion from those just entering this field about both the noise temperature of a system and the reason for the parabolic antenna. True, room or earth temperature is approximately 290 degrees K. That says that if you could 'load' or connect the feedline of your receiver directly to the earth, you would find [and be able to measure] a permanent noise temperature of around 290 degrees K. This is part of the reason why smaller dish antennas that must achieve a low look angle [i.e. they point at the satellite with an antenna elevation down close to the earth] are in trouble; the noise temperature of the earth, picked up by the side or minor lobes of the antenna, creates a 'noise floor' in the 290 degree K region and it is impossible [given the earth noise contribution] to create a system noise temperature that is appreciably lower than the earth's noise temperature. When your location plus the satellite you desire equals something less than 8 to 10 degrees in antenna elevation, the earth begins to contribute noise through the side lobes of the antenna. Larger aperture antennas have lower [less sensitive] side lobes and they therefore are necessary when the look angle gets low. The same thing is true with trees and other objects in front of the antenna, in line with the antenna's boresight heading to the satellite. Not only will trees absorb 4 GHz energy but they are a noise source at 4 GHz as well. The combination of extra loss from the absorbing trees [buildings, etc] plus the noise contribution from these 'blockages' creates a situation where you simply lose the 4 GHz satellite signal into the noise.

Sky noise, on the other hand, is in the under 25 degree K or so region. Because it is lower than the noise temperature you are creating with your LNA, it is not a problem. Present low noise amplifiers are able to achieve a unit noise temperature in the 100 degree K region withOUT cooling although liquid nitrogen [etc.] cooling techniques are utilized in large INTELSAT systems [utilizing cooled Parametric design amplifiers in the $50,000 per device range] where antenna system noise temperatures down in the 25 degree K noise region are required. If you took one of these INTELSAT installations with a 25 degree K system noise temperature and cranked the antenna around where it looked into the earth [say a nearby hill] the system noise temperature would then become approximately 290 degree K; simply because the earth's noise was the new 'noise floor' of the system.

The antenna configuration you suggest seems mechanically simple but electrically it is a bad choice. You are suggesting that driven [or dipole] antenna elements be stacked or phased together in some fashion. This involves coupling one to another, in a format that allows the signal picked up by one dipole element to be added to the signal picked up by the other dipole elements. At GHz the phasing or [to use a VHF phrase] 'stacking' lines or networks are at best lowsy. As you stack or phase driven elements you find that the phasing line sections

actually lose signal faster than you gain it by adding the dipoles together. The designer is also presented with monstrous impedance matching problems. It is not impossible **to make work [large phased arrays are common in radar systems in this frequency range] but it is far more expensive to tool for and build than the relatively simple parabolic curve that depends upon only a single 'dipole' [or monopole] 'detector' element mounted at the focus of the array.**



Bardley's "Screen Reflector" with phased dipoles

UNIVERSAL PARAFRAME MOUNT

Paraframe, Inc. (P. O. Box 423 / 1000 Sunset Drive West, Monee, IL 60449) antennas are now being equipped with a universal mounting plate for LNAs. This plate allows virtually unlimited interchangeability of LNAs since it can be adjusted for a wide range of offset LNA dimentions. The plate can be drilled to accept any LNA boltdown pattern and is now standard on all Paraframe TVRO antennas. Full details from Jim Vines at Paraframe.

GREAT OPPORTUNITY

I understand you were instrumental in organizing an international confereance dealing with the practical technology in the satellite terminal field. I would be very interested to receive information on equipment and firms in this field as I am interested in pursuing opportunities available in marketing complete systems in the Province of Saskatchewan. Ours is one of the wealthiest provinces in Canada and we are presently developing our abundant resources in mining and petroleum. The area is large but the popular per square mile very small. Most people live in small, remote communities or on large farms. The existing television service is very poor, the majority of the areas having only one or two channels of service. With the changing lifestyles that are sure to follow high energy and transportation costs, home entertainment will be forced to take on new meaning and priorities. I believe the market prospects for home satellite systems and I want to explore this potential.

John W. Shivak
Professional Engineer
Prince Albert, Sask.

Many people share your intuition about the coming importance of self contained living centers. With fuel costs soaring frequent trips to town for rural folks may well become occasional trips to town. More and more of what it takes to make life sustaining will have to center within the home and that does suggest that satellite television terminals may well become the 'travel vehicles' fo the 80's and beyond. The future...is here, now.

THE COMPONENTS SCENE

MORE PM-200

The RCA XL-100 module discussed in the October CSD is apparently destined to become a very popular method of extracting the desired FM sub-carrier audio from the TVRO receiver. Lindsey Riddle of New Orleans reports he found the unit available at several outlets under stock number 130-753 with a price tag of about $12.00. Several others report that there is a companion XL-100 module that mates with the PM-200 to give you 7 watts (that's the claim) of audio output. The audio module takes audio drive from the PM-200 through an interconnecting cable and the pair of units plus a coupling capacitor and a volume control puts you into the audio business for very few dollars. The PM-200 is apparently available in two different ways; either as a brand new replacement module (in the $12 price range) or as a re-built device in the $6 to $7 region.

CHARLIE'S VIDEO DISTRIBUTION AMP

One of the problems anyone runs into once he has his TVRO operating is how to insure that you have a sufficient number of video outputs that are (1) properly isolated from each other, and (2) properly 'leveled' to give you sufficient baseband product to drive modulators, monitors, test gear and the like. A video distribution amplifier is one possible; but video distribution amps are often complicated, and over designed by people who are after different performance than you.

The circuit shown in the November CSD came from Charles Kennamer of South Oklahoma City Junior College. Some of you who attended SPTS '79 this past August may recall Charles and his staff; they provided the first rate video production equipment and personnel to immortalize the event.

You have a 75 ohm video (baseband) input driving a garden variety 733. Perhaps other devices would also do the job (the 733 is still fairly expensive). This in turn drives a quad of RCA 40317 (many other substitutes available) devices. Each 40317 provides an isolated baseband output; 75 ohms. Voltage gain through the system is around 6 dB or so which means you can create four isolated outputs from the single output at about the same level as you came in. That should give you plenty of signal to loop video all through your installation to drive as many video operated (baseband) devices as you can dream up.

Our thanks to Charles Kennamer for sharing this most useful circuit.

Chip Source

Microwave system builders may be interested in a source of chip capacitors which for the occasional builder looks like a pretty fair deal. In fact, several enthusiasts could get together and 'chip in' on the package available and all come out with the required capacitors for a number of the projects we discuss here in CSD.

VITRAMON (P. O. Box 544, Bridgeport, CT 06601) has a 'sample kit' of chip capacitors (kit 101) which has been running on special for $59.95 (normal $99.95). The kit has 240 chips of various values in it and according to those who have ordered the kit "virtually all of the values are useful in TVRO work".

GaAs-FET Source

A new source of GaAs-FET transistors is **MELCO SALES, INC.** (3030 E. Victoria St., Compton, CA 90221). Their model MGF 1402 has a spec sheet noise figure of 1.1 dB at 4 GHz (3.0 dB at 12 GHz) with associated gain of 13 dB at 4 GHz and 8 dB at 12 GHz. MELCO has supplied some samples to several innovative builders such as Robert Coleman and chances are their performance will be discussed here in the coming months.

Missing Coupling Cap

The October issue of CSD contained a circuit for Robert Coleman's active GaAs-FET mixer. The schematic on page T7 should be modified so that the '4 GHz input' terminal couples through a .001 chip capacitor. The schematic shows the 4 GHz coupled directly from the coaxial connector to the input strip line.

The same schematic shows the operating voltage for the VTO 8360 as +24 VDC; this should be +15 VDC, as the alternate schematic at the top of the page notes. The VTO 8360 will function on +24 VDC but his is at the high end of its rated operating voltage range and Coleman has found the +15 VDC supply is better for the unit's stability.

Building Material Sources

If you are having difficulty locating some of the common-to-microwave but not stocked at the local radio emporium parts to construct your own 4 GHz receiving terminal, reader Steve Birkill supplies the following list of U.S. sources for the categories shown. Many of the firms have sales outlets scattered across the country and a call or letter to their offices given here may turn up such an outlet close to you. If not, you can deal with them directly.

PTFE-Glass Laminate Circuit Board

This is the circuit board which you must use in all microwave circuit areas. Board nomenclatures vary from company to company; explain what frequency range you are working in (4 GHz) and always order double sided board.

Keene Corp., Chase-Foster Div., 199 Amaral St. E, Providence, R.I. 02914 (401/434-2340)
Rogers Corp., Micromat Div., P.O. Box 700, Chandler, AZ 85224 (602/963-4584)
3M Company, Electronic Prods. Dept., 3M Center 223-4, St. Paul, MN 55101 (612/733-3350)
Oak Inds., Atlantic Laminates, 174 N. Main St., Franklin, NH 03235 (603/934-5736)

SMA Coaxial Connectors

These are the tiny connectors highly recommended for 3.7 GHz and above, especially for intra and inter-stage connections.

Sealectro Corp., 225 Hoty St., Mamaroneck, N.Y. 10543 (203/258;6261)
OmniSpectra Inc., Mico Conn. Div., 140 Fourth Av., Waltham, MA 02154 (617/890-4750)
Connecting Devices, Inc., 125 Lomita St., El Segundo, CA 90245 (213/322-6885)

CHIP Capacitors

In addition to sources given in previous issues, and including some of those sources, here are places to locate hard to find chip capacitors.

Vicramon North America, P. O. Box 544, Bridgeport, CT 06601 (203/268-6261)
Johanson Dielectric Inc., Box 6456, Burbank, CA 91505 (213/848-4465)
JFD Elec. Components Corp., 15th Av. at 62nd St., Brooklyn, NY 11219 (212/331-1000)
Dielectric Labs Inc., 64 Clinton Rd., Fairfield, N.J. 07008 (201/575-8922)
ATC Inc., 1 Norden Ln., Huntington Station, NY 11746

Readers with updates, alternate parts sources should report same to CSD for future updates of this listing.

REAL WORLD TECHNOLOGY MATERIALS

Steve Birkill makes some of his circuit boards and past writings available on a **direct** basis to readers of CSD. All prices are in pounds Sterling which simply means that you must go to your bank and obtain a check/Sterling order in the proper exchange amount (as computed at the time the check is drawn).

2 Stage LNA Circuit Board - As originally described in CATJ for July 1979 and subsequently described in early versions of the Coleman TD-2 Conversion Manual. Board is Chase-Foster Di-Clad 1/32 inch PTFE-glass laminate, etched with the 2 stage LNA circuit but undrilled. Price is 20 pounds per board.

Consultancy Service - Brikill's unique background and knowledge in the satellite world equips him to find hard answers to hard problems whether North American oriented or world-wide in scope. Consulting by letter only, state your questions and objectives clearly. Response by airmail; price is 10 pounds per letter.

CATJ Birkill Articles - Articles written by Birkill appearing in CATJ magazine are difficult to locate. Copies through CATJ are no longer available. Copies directly from Birkill are available at 2.5 pounds per article. Titles available are:

10/78 - **Introduction**, background, Birkill terminal, phase-lock demodulator.
11/78 - **Down-link equation**, G/T evaluation, az/el angle graphs
12/78 - **Bandwidth requirements**, pre-emphasis, Atlantic satellites (INTELSAT)
1/79 - **Energy dispersal**, Pacific and USSR satellites, transponder frequencies
2/79 - **Practical Multipole feed**, leased INTELSAT TV channels (Spain, Sudan, etc.)
3/79 - **Outline** of experimental receiver, downconverter (remote)
4/79 - **Orbital congestion**, Ku-band systems, BSE, CTS, OTS
5/79 - **Ku-band** receiving techniques, comparison 12/4 GHz systems
7/79 - **Detailed design** for 300 degree K bipolar LNA, 4 GHz
9/79 - **System calibration** utilizing ground noise/stellar noise.
10/79 - **System calibration** using solar noise / stellar noise.

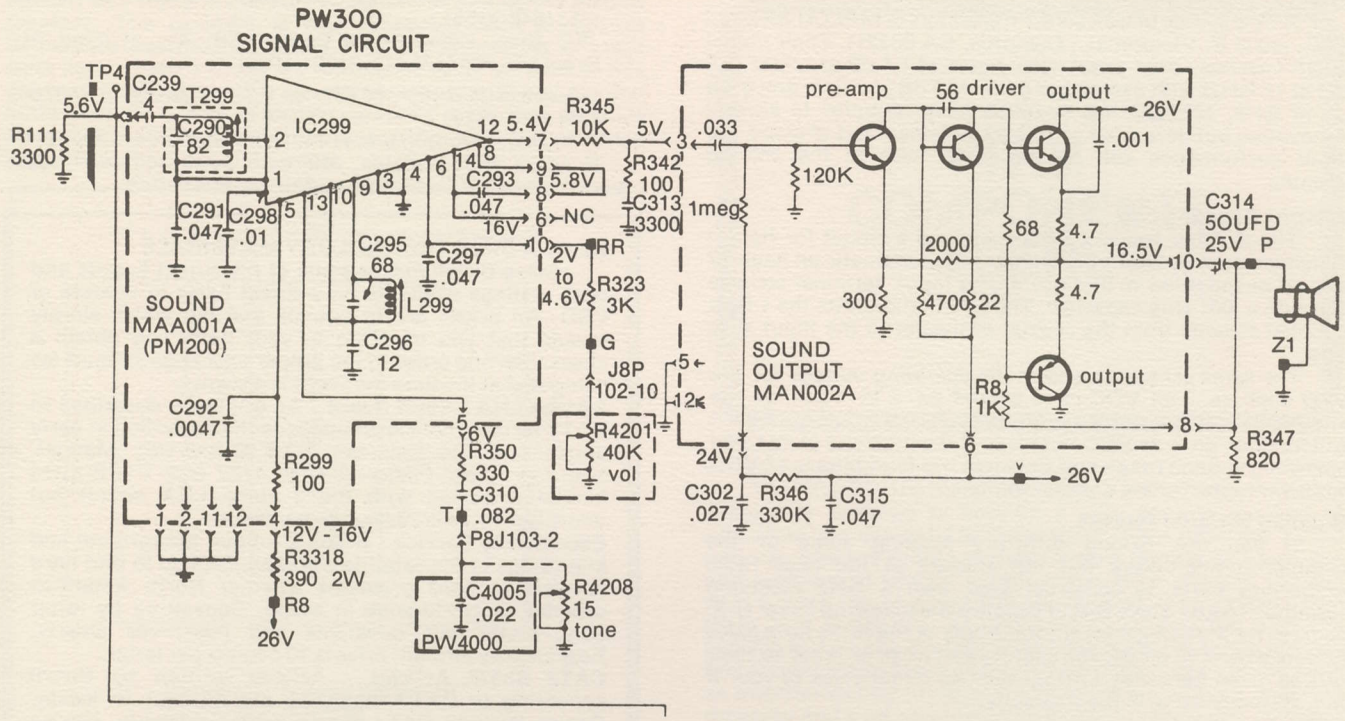
To order any of these Birkill materials, you may write: **Mr. S. J. Birkill, Real-World Technology, 128 Cross House Road, Grenoside, Sheffield, S30 3RX, England.**

REVISITING PM-200

CSD reader and satellite enthusiast Steve Gibson of Los Angeles provides some additional data on the October **CSD** described circuit utilizing the RCA PM-200 subcarrier audio module. Steve's information is so thorough that we are providing readers with an expanded schematic of the system.

Steve reports the RCA replacement number is MAA001A. The cost for the module, in Southern California, was $14.30 per module plus a $3.00 charge for not turning in a 'dud'. Total cost then just over $17.00. As Steve notes ''a moments reflection at the layout will reveal that the IC is the popular LM3065 (CA3065, MC1358) and is indeed the substance of Tay Howard's sound section design! ''.

Steve goes on to note that while 33 pF was suggested as a substitute for C290 and C295 he found that by placing 47 pF for C290 and 25 pF for C295 this allowed him to **tune** the full subcarrier band from 5.5 to 8 MHz with ease. He also notes that you must remove the T299 can to change C290 and having done so must **replace the can** on T299 or the circuit will not function (i.e. the can has importance!). He also notes that the circuit published in the October CSD does not make use of the electronic attenuator built into the LM3065 although his



modification as shown here does and with fewer overall parts.

Exact tune-up details on this module and the companion audio power amplifier have been published in TAB BOOKS #662; ''Servicing The New Modular TV Receivers, Volume 1'' by Stan Prentiss. He also suggests seeing pages 29, 35, 47, 51, 57, 59 and 79 of the 'Sams Photofact' on the (RCA) CTC-48 chassis for the same details.

''Alignment is a piece of cake. All you do is feed your RF generator into pin 3 (pins are numbered left to right on the trace side but 1 and 2 are combined as are 11 and 12) **and hang a wideband scope on pin 9 of the IC. Set the generator to the desired frequency** (mostly 6.8 MHz on SATCOM and 6.2 MHz on WESTAR) **and then tune T2 and L2 for maximum. Last, back the generator down below limiting and peak again. You may still need to tweek on L2 to finally clean up the audio in an actual reception situation.''**

Steve continues ''I did a little research and learned that R299 can be 220 ohms on some modules though it doesn't seem to matter in as much as the unit worked fine on both 12 or 16 volts. The supply must be well filtered. Just like Tay's circuit, I used 50K for the volume control and minimum resistance was maximum volume. (However), I found the sound quality to be rather 'bright' without the tone control parts option.''

Hat's off to satellite enthusiast Steve Gibson for taking a **CSD** circuit and making it better and easier for the rest of us to understand. Will this be the final segment on the ubiquious PM-200 module? We doubt it!

HOWARD TERMINAL UPDATE

ADDITIONAL IMPROVEMENTS

Of all the circuits and systems in operation in private satellite TV land, the Howard Terminal system is perhaps the most widely duplicated and its practioners reportedly are very happy satellite-video-nuts.

Well over 1,500 of the Howard Terminal Manuals have been distributed to date and there is every indication that by the end of SPTS '80 in Miami that number will double. This means a lot of people have directly acquired this manual from STT and who knows how many 'bootleg' copies exist on top of this 'original copy' quantity!

In the October **CSD** we reported on some editorial improvements which were to be added to those manuals already in place; and to those terminals already in operation or under construction. System designer Tay Howard now provides some additional modifications including a newly designed marriage of the video demod system and the video stages. The schematic for the 'marriage' appears here. Note that this revised, updated circuit replaces **both of the circuits** appearing on pages 19 and 23 of the Howard Terminal Manual.

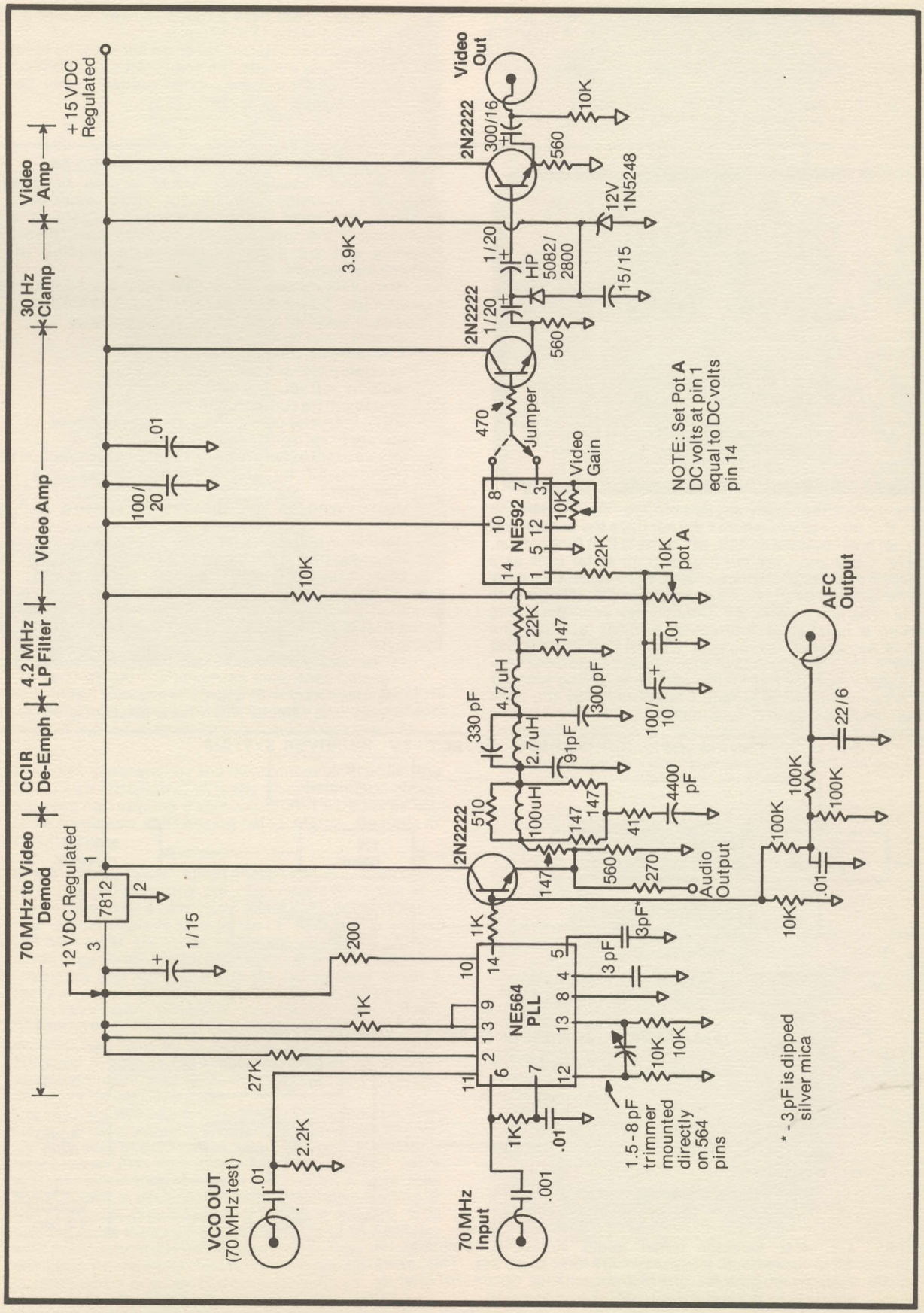
Does this suggest that the circuits on pages 19 and 23 do not work properly? No, not at all. This modified circuit is simply 'better'.

Other Changes

For those with existing hardware based upon the Howard Terminal Manual, here are some improvements that will capture the essence of the revised video demod and video amplifier shown in combination here:

Video demod card/page 19:

1) **Remove** the 4.7K resistor from pin 14 of the NE592 going to the 5.6K resistor;
2) **Eliminate** the 100/10 in series between pin 14 of the NE564 and pin 14 of the NE592 (also a 22K resistor here). **Replace** this removed capacitor **with a jumper.**


70 MHz to Video Demod
CCIR De-Emph
4.2 MHz LP Filter
Video Amp
30 Hz Clamp
Video Amp
+15 VDC Regulated
12 VDC Regulated
7812
1/15
200
1K
27K
2.2K
.01
VCO OUT (70 MHz test)
70 MHz Input
.001
1K
.01
NE564 PLL
1.5-8 pF trimmer mounted directly on 564 pins
3 pF
3pF*
1K
10K
10K
2N2222
510
100uH
147
147
41
4400 pF
560
270
Audio Output
330 pF
4.7 uH
2.7uH
91pF
22K
147
300 pF
100/ 10
.01
10K pot A
22K
10K
NE592
Video Gain
10K
470
Jumper
100/ 20
.01
2N2222
1/20
560
3.9K
1/20
HP 5082/ 2800
15/15
12V 1N5248
2N2222
300/16
560
10K
Video Out
NOTE: Set Pot A DC volts at pin 1 equal to DC volts pin 14
AFC Output
22/6
100K
100K
100K
.01
10K
* - 3 pF is dipped silver mica

3) **Replace** the 5.6K resistor in series with the 4.7K (pin 1) to ground on the NE592 with a 10K pot. Adjust this pot so that the DC voltage appearing on pins 1 and 14 of the NE592 is equal on both pins (using pin 14 as the reference).

Audio card/page 24:

1) The lead from pin 5 of the CA3065 to the +12 VDC buss should have a (new) 10 ohm resistor (**between** pin 5 and the 12 VDC buss).

Tay Howard and Robert Coleman are working together on a single board to include the combined circuit shown here. When completed the board will be available from Coleman; we'll keep you advised.

THE WORLD ABOVE 10 GHz

by
Robert M. Richardson
Richcraft Engineering Ltd.
Drawer 1065
Chautauqua, N.Y. 14722
[716]753-2654

Hello there. I met many of you at CCOS '78 in Oklahoma last year. For those of you whom I did not have the pleasure of meeting, let me introduce myself. My name is Bob Richardson, W4UCH/2. Coop and I are old friends from as far back as 3 sunspot cycle peaks ago when we used to work each other daily on the 6 meter VHF band, via F2 propagation from Virginia to California. The last 2 years my vocation has been designing and testing a number of interesting projects utilizing the Microwave Associates' Gunnplexer (tm) 10 GHz transceiver module, with the end objective of writing a 300 page Cookbook on the subject. The book was finally completed during summer '79 and is being published around Christmas '79 by the Ham Radio Publishing Group in Greenville, NH.

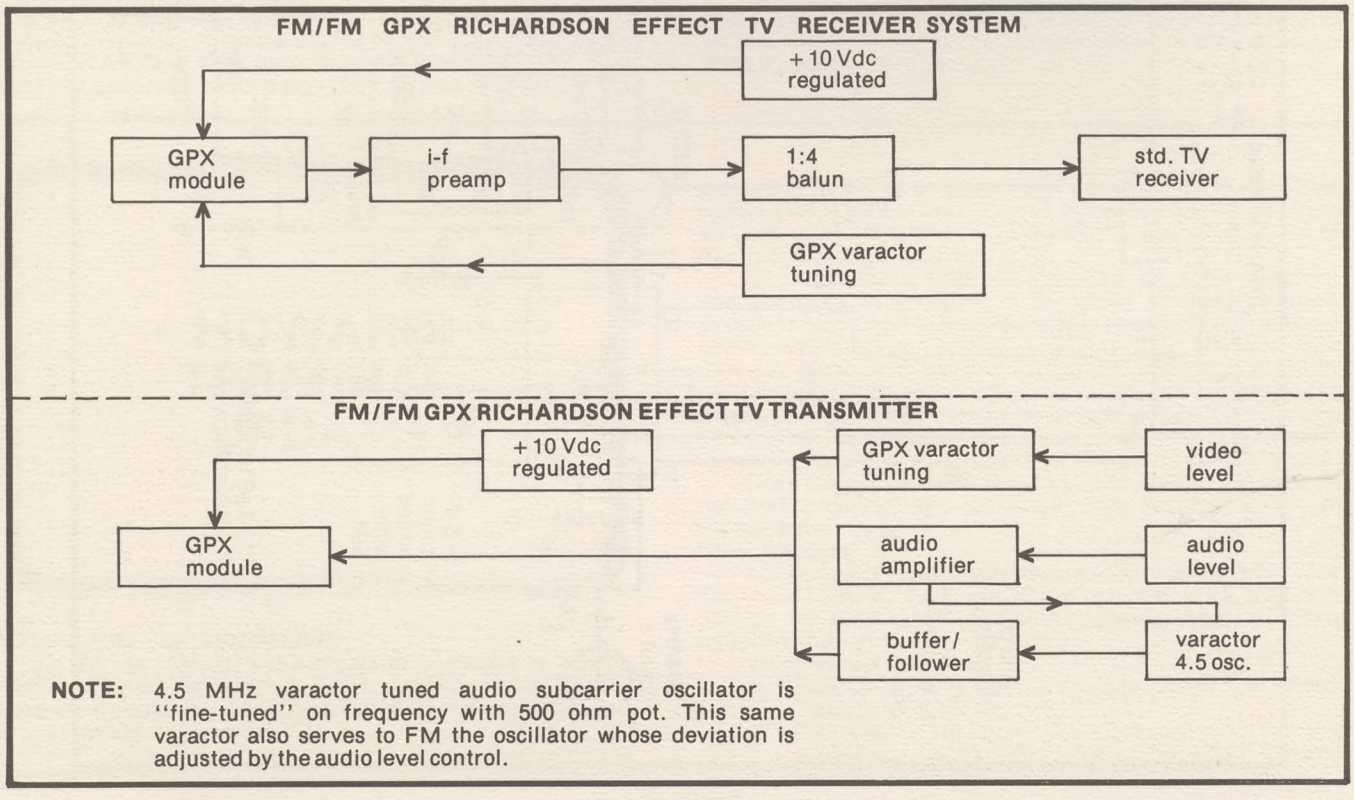
GUNNPLEXER COOKBOOK/A FEW SURPRISES:

The GPX Cookbook is aimed at the newcomer to microwave techniques including: radio amateurs, E.E. students, and most anyone interested in gaining a solid foundation in the subject. Its 16 chapters cover theory quite modestly and are primarily devoted to building low cost systems that include:

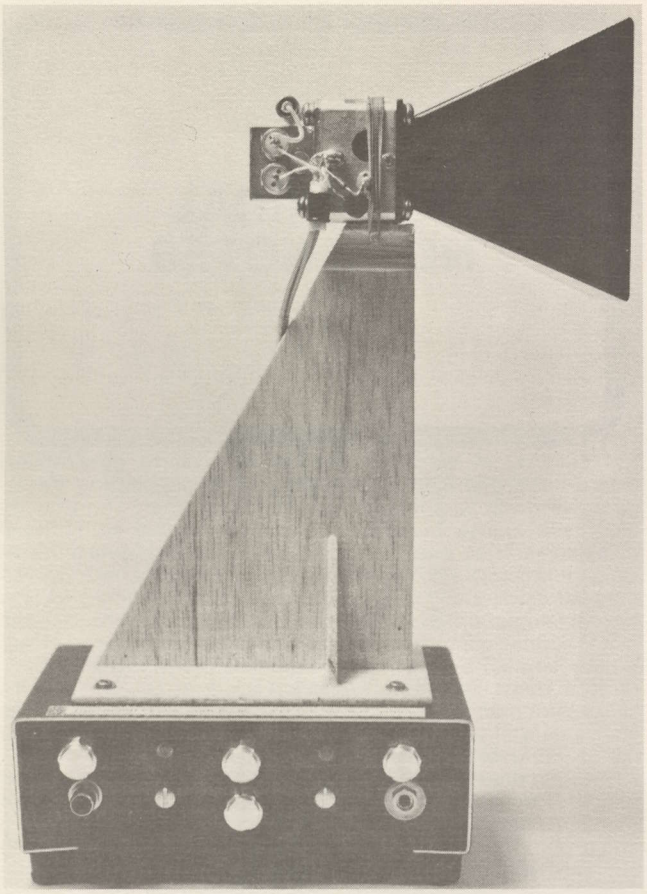
- -frequency measurement (Sears Roebuck micromemeter)
- -relative power measurement (Poly Paks diodes)
- -power supplies and system control modules
- -proportional temperature control
- -low noise i.f. preamplifiers
- -weatherproof enclosures and mounts
- -automatic frequency control circuits
- -wideband fm communication systems
- -10 GHz crystal-controlled weak signal sources
- -parabolic reflector design & construction
- -crystal-controlled phase lock system (Chautauqua effect)
- -narrowband fm afc communication systems (3 kHz deviation)
- -narrowband fm crystal-controlled systems (840 cycles dev.)
- -television and computer video data links
- -epilogue (this is the big surprise)

Most of the material is straight forward and well known to any practicing microwave engineer, but through sheer serendipity two rather surprising discoveries were made that to the best of our knowledge have never been reported in the literature.

1) The first discovery was that by introducing a crystal-controlled harmonic at "the 10 GHz i.f." of a Gunnplexer, with appropriate amplification and feedback to its varactor, the am and fm spectral noise (this is



NOTE: 4.5 MHz varactor tuned audio subcarrier oscillator is "fine-tuned" on frequency with 500 ohm pot. This same varactor also serves to FM the oscillator whose deviation is adjusted by the audio level control.



BARE BONES 'Richardson Effect' FM/FM receiver; apply 10 VDC to Gunn diode, coarse and fine varactor tuning produces VHF channels 2-13 i.f. output directly to television receiver.

the noise generated by the mechanism with which the Gunn diode oscillates) virtually disappears thus allowing very narrowband communication; i.e., such as 850 cycle frequency shift keying using Morse, Baudot, or ASCII code.

There is nothing "new" about phase-locking a Gunn oscillator to a reltively **pure** (spectral noise) harmonic of a crystal oscillator at the Gunn diode frequency. What is new is being able to do it at the i.f. with only a simple $39 ham radio 3/4 meter power source using a cheapy diode to generate the 23rd harmonic at the 10 GHz (i.f.) frequency and feeding it into the Gunnplexer about 2 feet away from the GPX module without butchering up the module itself. We called this discovery the "Chautauqua effect," for the locale where it was first discovered and reduced to practice. It has no impact or effect on wideband fm operations such as TV or computer video data links which would be of interest to you, so let us skip past it for now.

2) The second discovery will be of interest to you as it concerns a grossly simple means of implementing a 10 GHz TV data link, point to point relay, and/or TV distribution system that can supplement/complement cable systems. Most engineers will not believe it **until** they see it (which is understandable) as it violates many of the principles they have been taught since GO. It is nothing more than using a simple 10 GHz Gunnplexer with FM video carrier and FM audio subcarrier to relay a complete TV channel from one point to another where it is received by another Gunnplexer (with i.f. preamp) **and fed directly into a standard American NTSC television receiver with no FM to AM conversion of the video signal whatsoever.** It sounds impossible, but video and audio is **studio quality.**

RICHARDSON and his pair of W4UCH 10 GHz Gunnplexer systems.

SUPER SHOCKSVILLE

This discovery was made on April 3, 1979 and tested on 6 different varieties of ordinary commercial black & white TV receivers (we have not yet discovered color though it will work with color as well as black & white), since we too did not at first believe it possible to run raw FM video with audio into a standard TV receiver and see anything but garbage and the like. Studio quality video from **pure** FM? Who are you kidding?

5.5 MILE PATH across Lake Chautauqua at 10 GHz utilizing a pair of Gunnplexers with 25 inch 'Snowsled' [$7.00 each!] parabolic reflectors.

All the textbooks, literature, commercial microwave video relay systems do indeed transmit FM video, but it is **then demodulated** to a baseband video signal which is used to **amplitude modulate** a carrier on the proper TV channel and the lower sideband filtered out (vestigial sideband) before being put on cable and/or input to a TV receiver.

Still not believing what we were seeing with FM video, we ran the following tests before even making a notarized patent disclosure:

-Was it only **slope detection** on a single misaligned TV set?
-No it was not. As mentioned previously it worked on: RCA, Admiral, Philco, Zenith, Sanyo and Panasonic TV receivers with video and audio as good as any studio quality.
-Was the FM signal being detected (converted to am) by the TV receiver's rf/mixer stage?
-No it was not. Worked just as well fed into TV i.f. strip.
-Does the Gunnplexer signal include a large am component?
No it does not. Virtually zero beyond 1 kHz from carrier.
Does the Gunnplexer 10 GHz mixer create an am signal?
-Highly unlikely. It is a low Q very broad (500 MHz+) circuit.
-Could the Gunnplexer i.f. preamp somehow generate AM?
-No. It works just as well without preamp on short ranges.
-Ok! Just how does it work?
-It probably is simple TV set i.f. amplifier slope detection on all 6 TV sets tested. Flat i.f.'s are just folklore!

SUMMARY

Well, now, the cat is out of the bag, the fat in the fire, or what-have-you. There is nothing sneaky, tricky, or difficult about building a FM/FM TV data link system whether you want only to cross a narrow river, a 2 mile lake, a 5.5 mile relay, or to the neighbor down the block. A fascinating aspect of this discovery which we have modestly named the "Richardson Effect" is that even **without** proportional temperature control or automatic frequency control (AFC), a single GPX receiver may be easily tuned to receive 7 different TV channels (a guard channel is placed between each active channel if no AFC or proportional temperature control is used; i.e., active channels would be 2, 4, 6, 7, 9, 11, &13 Next month we will cover schematics and construction detail of the basic system.

RICHCRAFT ENGINEERING LTD.

Richcraft Engineering, Ltd. offers you a no-charge computer generated printout of a) true heading, b) elevation and c)range from your location to: COMSTAR I,II,III;SATCOM I,II,III & WESTAR I,II,III. Please include your location's longitude and latitude (from a road atlas OK) and $5.00 to cover postage and handling. Send to Richcraft at Drawer 1065, Chautauqua, N.Y. 14722 (telephone 716-753-2654).

SATELLITE 'Ham' NET

...meets Sunday at 1900 Z on 14.311 **or** 14.343 (latter frequency when 14.310 is busy with emergency phone patch traffic). Net control is either W5KHT (Coop), W5JG (Lindsey) or KA4BCF (Lib Coleman). Typical check-ins include Robert Coleman (K4AWB) for those working on TD-2 Conversion.

TECHNICAL NEWS NOTES

Security of satellites starting to concern government officials charged with responsibility of implementing **Emergency Broadcast Service** (EBS). EBS exists to provide emergency radio broadcast to public in time of national disaster such as nuclear war. System is headquartered at Cheyenne Mountain, Wyoming and Mt. Weather near D.C. In event of attack, normal radio broadcasting would cease and via terrestrial (landline) interconnected EBS network citizens would receive official government news. Unfortunately system is married to AP and UPI news **wire** services terrestrial lines. If radio stations switch to satellite and drop terrestrial wire service inter-connects, EBS would have to switch to satellite as well. One well placed blow from enemy would wipe out whole national system by downing satellite.

Space Shuttle program continues to suffer setbacks; most recent first week of November when engine test failure destroyed motor. Liklihood that President Carter will approve and urge Congress to approve an additional billion dollars to get program back on track is high. Meanwhile Canada's Telesat has asked European Space Agency for proposal for Telesat ANIK DI and D2 launches in 1982. DI and D2 are 4 GHz replacements for ANIK A series 4 GHz birds.

Pricing on Microcomm receiver modules due to increase this month. Modules have been produced by H. Paul Shuch's San Jose, California firm during summer and fall but manufacture shifts to International Crystal Manufacturing, Inc. (under licensing agreement) by first of year.

PRIME TIME SUNDAY - Coverage of SPTS '79 and private TVROs now rescheduled December 16 or 23; check your TV Guide listing.

Scientific-Atlanta has a new 150 page satellite products catalog. Write for no charge copy from Mickey Hudspeth, Scientific-Atlanta, 3845 Pleasantdale Rd., Atlanta, GA 30340.

COOP'S COMMENT ON PROGRAMMING

IN AGAIN / OUT AGAIN

Following the October 18th FCC deregulation decision Scientific Atlanta President Sidney Topol told a group of security analysts in New York City that he was very 'upbeat' and 'pleased' with the FCC decision. He reported that HOMESAT had sold 25 private (home) terminals to that point (and we assume proceeded to license each), but with the decision he anticipated HOMESAT would sell 'thousands more'. On the question of 'piracy' Topol said "**it is solvable**".

One week later S-A announced they were pulling out of the direct business; they will no longer solicit nor accept orders from people who want private terminals. Topol said "**We do not intend to become part of an industry where signals are pirated**". Apparently the piracy 'problem' was not so solvable afterall.

What is the piracy problem?

Simply this. Satellite signals extend in coverage from near the Artic Circle on the north to northern South America on the south; from Bermuda and points east to Hawaii and beyond. Anyone with a receive terminal that is properly engineered for the location can tune in anything on any satellite that is within 'eye-shot'.

Most of the really appealing material on satellites these days is up there for either private use, or public use; but the high interest public use material has a fee attached to it. Cable companies collect a fee for their services and this is their measure of control of illegal reception of services. It is worth noting that Chris Smith, editor of the cable operator's **TVC** magazine talks in his November 1st editorial about an "**estimated 2,000,000 illegal homes connected to cable nationwide**". If only 10% of these homes, connected illegally to cable, are ripping off a premium service such as HBO, this little breach of security is costing HBO and the cable operators a tidy $2,000,000 per month.

Sid Topol says that from hence forth HOMESAT will distribute terminals only through cable firms. HOMESAT recently sold $5,000,000 in private terminals to Tele-Communications, Inc., a Denver based communications conglomerate. HOMESAT's Dick Campbell tells us that TCI will **only** lease HOMESAT terminals to homes and ranches "**because in that way they can guarantee payment to the program suppliers on the satellite**". In essence, if the ranch owner doesn't pay for what he watches, TCI will march in and yank out his dish antenna.

Topol backs this up with the comment "**Cable operators are natural allies in HOMESAT marketing because they've spent the last 20 years figuring out how to bill customers**". Topol apparently doesn't know about Christopher Smith's estimation that 2,000,000 U.S. homes are illegally hooked to cable.

Plainly people are worried about security. HOMESAT once thought that one of the best ways to get people to pay was to offer to supply them with a program guide or schedule for the various services subscribed to as part of the annual fee. That was before the New York Daily News, the New York Post, the Fort Lauderdale News, The Miami News, The Miami Herald and some 200 newspapers started printing daily listings for SHOWTIME, HBO, Madison Square Garden and others. Now TV GUIDE's New York Metro edition does it too. A week in advance no less.

People...some people, just naturally want to rip things off. If Chris Smith's two million illegal cable homes is close to the mark, that represents 1 home in 8 stealing service (the cable industry is now serving around 16,000,000 U.S. homes). Ronald Reagan in his King Features syndicated column appearing nationally November 6th writes about the problems the New York City Con-Edison power company is having with illegal electrical taps on the line. Con-Ed says they believe one customer in 5 (or 20% of all customers) engages in outright electricity theft or 'meter tampering'. Con-Ed also says they had to increase all of the paying customers service rates by 10% to cover the losses in juice. That 10% figure amounted to $145 million last year. Con-Ed fights this battle by offering 'finder fees' to anyone who turns in someone else who is stealing power. More than 20,000 (!) bounty requests have been received and in court Con-Ed is running about 20% judgements in their favor. Reagan ends his report with the note that until the power company comes up with a tamper proof meter head, the wholesale cheating of the utility lines is bound to continue.

A paranoia is now sweeping the satellite premium program suppliers. HBO never would sign up an individual home. SHOWTIME did until early in November, then it decided to back off also. Warner's STAR CHANNEL now has six paying home customers (at $96 in advance for a year) and they claim they'll continue accepting private home money. HBO is intent on scrambling, even if the scrambling screws up the picture quality for cable firms as well. A recent proposal from Harris to HBO spells out how HBO should close this security breach.

And so the games go on. Perhaps Con-Ed has the answer; simply raise the fees a few percent to cover the losses. Not a very pretty statement on our 'democracy' but perhaps the most practical answer of all.

CSD

PROGRAMMING

COOP'S SATELLITE DIGEST (Programming Edition) is produced monthly by Satellite Television Technology, P.O. Box G, Arcadia, Oklahoma 73007 (405-396-2574). CSD is available in two separate editions (Programming and Technology) or as a combined subscription. Subscription rates are $30 per year for first class mail delivery within U.S.A. or Canada for either edition, or $50 per year for the combined editions. Outside U.S.A. or Canada add $25.00 per year for any subscription. All subscriptions to be paid in advance in U.S. funds drawn on a U.S. bank; no invoicing.

WHAT FCC DEREGULATION REALLY MEANS

As reported in the November issue of **CSD** (see Coop's Comment On Technology, page T1) the FCC on October 18th finally determined under Docket 78-374 that people or firms wishing to engage in satellite reception (video, video plus audio, data, audio only, etc.) need no longer obtain an FCC construction permit (and license) for their receive-only terminals. Ostensibly, happy days are here again.

The Commission's decision was not unexpected. Rumors in Washington and the industry have been forecasting just such an action for many months. If there was anything surprising about the decision, it was the frankly sloppy way it was handled by both the Commissioners and the staff. Clearly, for those who had either the opportunity to attend this 'open session' of the Commission, or who have had the opportunity to view the (black and white) videotape acquired from the FCC's library, not everyone participating in this 'great decision' was up to speed on either the questions nor the importance of the issue.

Even if you were on hand, or viewed (and reviewed) the videotape of the event, the meeting itself was confusing. Only a couple of Commissioners seemed to understand what the issue was and the staff presentation fell short because it addressed only the singular issue of "licensing **or** no licensing". As the transcript of the session reveals (see later portion of this report) having determined that no licensing would be mandatory in the future, the staff was not prepared to deal with the next phase of the deregulation. Additionally, the question of dealing with obtaining program rights viewing permission was scantily discussed with the off-handed remark by one Commissioner and agreement by a key staff member that encryption was the logical answer to 'pirated viewing'.

From the private terminal operator's vantage point, the decision was so 'black and white' (i.e. cut and dry), by a 7-0 unaminous vote, that it seemed almost too good to be true. "Where were the 'hidden restrictions . . ." we kept asking ourselves. "Surely someplace in here they want us to REGISTER the non-licensed terminals . . .". Well, if they do, that will come later. For right now and until the staff can put together a document for Commission approval creating a registration procedure and process, there is simply nothing for you to do but build your terminal, and having obtained the written permission of at least one program supplier, turn the terminal on. That's all there is to it for now.

WHAT YOU GIVE UP . . .

At the present time you have two possible routes to follow in activating any TVRO / ARO terminal.

1) Just build it and turn it on;
2) Go through frequency coordination, paper engineering and FCC application and obtain a license.

(A third way is to obtain an experimental/developmental license under Part 25; which would now seem to be largely a waste of time since you receive no special benefits for following this approach and indeed must re-new the license each year with accompanying reams of paperwork.)

If you just build the terminal and turn it on, you have no right now or at a later date to complain to the FCC about whatever (terrestrial) signal interference as you might encounter. If your terminal gets zapped by a Bell microwave circuit or some other licensed terrestrial transmitter operating in the 3.7 to 4.2 GHz range, that's your tough luck. It will be your responsibility to solve your own problems since the FCC has not licensed you; and cannot help non-licensees with interference problems.

If you wish to have FCC sanction for the terminal, the new deregulation ruling changes the rules a bit. For example:

1) **You may construct the terminal as you wish,** while indeed you are preparing and filing your lengthy license application with frequency coordination. While the terminal is operating with**out** a license, you have no FCC recourse for interference. **After the license is granted,** the FCC will see that no new terrestrial microwave sources are authorized which might interfere with your reception.
2) **If you already have a license** and wish to modify it so that some other (business) entity will share the terminal with you, you no longer need to get a formal modification of your license. Just go ahead and plug the other guy in. (Non-licensed terminals can of course share with anyone they wish without restrictions.)
3) Up until now all TVRO/ARO licenses have been for three year terms. From now on the licenses are granted for five year terms.
4 When a current license does finally expire, the licensee can either renew the license (and maintain his 'protected status') or he

can simply fail to renew. By failing to renew you lose your protected status.

5) When submitting new applications for new CP/licenses you no longer need file financial and economic support data (i.e. data which shows that you have the financial ability to build the station and to keep it running); and you also don't have to file FCC Form 403 which is your 'character qualification' data.

Anyone with a license application pending at the FCC at the time of the decision had the option of either leaving the application in place or simply asking for it back. For those wishing to trace the language of the decision, apart from the dialogue report tendered here, the FCC Report and Order file number is 79-665.

In an attachment to the release made by the Commission in this area, Chairman Charles Ferris noted:

"It is often more costly to undertake FCC licensing and frequency coordination than to relocate an occasional earth station if the need arises. Frequency coordination, an essential prerequisite to licensing, may cost as much as $3,000 per station. With hundreds or thousands of stations . . . it might make better economic sense to move those few which receive interference than to pay hundreds of thousands of dollars for the frequency coordination for all of these stations".

Perhaps the most organized effort to get deregulation through has come from the radio network people. The Mutual Broadcasting System (MBS) in particular has been held back at the starting gate for nearly two years with its plan to install approximately 500 audio receive only (ARO) terminals at radio stations throughout North America. Most of these terminals are to be 10 foot dish systems with 200 degree range Kelvin LNAs and relatively simple audio demodulator systems. Mutual had sought a waiver of both the FCC's licensing and the FCC technical standards for this network. Under the October 18th decision not only are new installations given the right not to obtain a license, but they may now also install whatever antenna size, LNA noise temp and receiver threshold they wish. Under the licensing scheme every system has been forced to paper engineer their system so that it maintains a 3 dB excess carrier margin above the receiver's FM threshold point. Under the decision, an unlicensed terminal can operate all of the way down into the sparklies if it wishes; the Commission cares not.

The essence of the October 18th meeting follows. This text was transcribed from the black and white videotape CSD obtained of the Commission's session. Those readers interested in having their own second generation dub of this historical FCC session should contact Susan Cooper at CSD.

10/18/79 - FCC/WASHINGTON, D.C.

Chairman Ferris:

The meeting will come to order. The first item for consideration this morning is the Common Carrier Docket number 78-374...the regulation of domestic receive only earth stations. Bill...

FCC VIDEOTAPES OPEN PROCEEDINGS - copy of tape dealing with deregulation of small earth terminals was obtained by CSD reader Paul Fox who attended the October 18th meeting.

Staff:

Mr. Chairman, Jane Mago will present this item for us.

Staff:

Good morning. The proceeding which produced the item before you today began last November when the Commission adopted a Notice of Inquiry and asked for public comment on the possible deregulation of receive only earth stations. There was a very large response from the request. The commentators took many positions but the majority favored some form of deregulation. As a result, the staff proposes the following deregulatory action.

First, adoption of a policy of voluntary or optional licensing giving the station operator a choice of whether or not to seek protection from interference which licensing provides.

Secondly, elimination of the construction permit requirement for those who do choose to be licensed.

And third, elimination of a modification of the license to initiate cost sharing non profit use of the earth stations.

Fourth, we suggest a reduction in the amount of information required in a license application. In addition, the staff suggests that further deregulatory steps may be taken through a Notice of Proposed Rule Making which is being prepared.

Focusing first on the optional licensing program; the Bureau proposes a policy whereby the station may choose to seek protection from the interference that may result from terrestrial transmissions through frequency coordination and Commission licensing. Those who seek protection will continue to be licensed; those who do not seek protection will operate at their own risk. If interference occurs at the unlicensed site, the unlicensed operator will be required to bear the burden of relocation or shielding.

The advantages of this proposal are that first it provides freedom of choice for the station operator. Secondly, it enables operators who seek protection to obtain that protection through the Commission's processes. Thirdly, it enables the Commission to maintain our control over the management of the spectrum space. Fourth, it maintains our satellite policy objectives of encouraging entry into the market and encouraging technological development. Fifth it maximizes the opportunities for large system users to develop with the least regulatory restraint.

Parties raised two objections to this proposal. First, the terrestrial operators fear that unlicensed receive only operators will attempt to deny terrestrial applications where they see that these applications may cause interference. We

considered this argument and concluded that although such objections may be raised, we will state that they will not be considered placing these operators on notice that they are taking a chance; that they are operating at their own risk and they will not be allowed to present objections to the terrestrial applications.

Commissioner:

But what happens if we register a small earth station operator, what happens later on if you have a terrestrial application for a microwave? Will that (terrestrial) operator take precedence over the registered satellite (terminal operator?

Staff:

Well, the frequency coordination process as it is operated now requires licensing. If you went to a registration scheme someone who is registered would still be within the frequency coordination process and have the protection...

Commissioner:

I realize that. But what happens if after we register the earth station you (then) have an applicant for a terrestrial microwave? Who takes precedence there?

Additional Commissioner:

There is no registration (process) in this proposal...

Commissioner:

Yes, he will be registered.

Staff Member:

There is a proposal in the item to have a look at a registration scheme which I think conceptually is not too different from registration of deeds. I think that is a bridge we have to cross...we will want to cross it someplace. Under the present proposal if someone were to choose voluntarily to obtain a license, go through the frequency coordination process, that earth station would continue to have priority, would continue to have precedence over a terrestrial applicant.

Staff:

As the frequency coordination process works now, Commissioner, usually an accomodation is reached between the parties. There is a type of right that exists but there is an accomodation generally...

Comissioner:

Yes, well you see the item...at least it was not clear to me what precedence would be assigned...what priority would be assigned later on if we go to the registration means. It seems to me that an applicant for terrestrial license might be able to overcome the registered earth station. We haven't made up our minds on that (have we???)...

Staff:

We haven't...but perhaps it would be helpful if we worked up some additional language that explained a little more fully the...what the forthcoming proposal will entail. I agree with you, to some extent the explanations that surround the discussion of the forth coming rule making are very skeletal and they really are subject to some confusion, some mis-understanding.

Commissioner:

I didn't mean to criticize. I just didn't understand.

Staff:

The second argument which was raised against the optional licensing program concerned Section 605 of the act, which prohibits the interception and use of signals. The parties here argued that mandatory licensing should be maintained as a means of enforcement of Section 605. We considered the argument here and concluded that licensing was not required to enforce 605; that the adoption of a voluntary licensing program removes only one weapon from the arsenal of tools for enforcement purposes and that is the option to revoke the operators' license. Other remedies including civil lawsuits, criminal lawsuits, copyright proceedings, and the possibilities of issuance of forfeitures or cease and desist orders still exist. Therefore we conclude that licensing...mandatory licensing, was not necessary for this purpose.

Our other suggestion, including the elimination of the Construction Permit requirement, reduction of the amount of information to be required and removal of the requirement that operators modify their license to implement non-profit cost sharing agreements with unaffiliated parties are designed to lessen the administrative burden on the applicant. No objections were received to these changes.

There have been a number of editorial changes suggested by the General Counsel's Office which were circulated to you yesterday. These changes make no substantial difference in the outcome of the item. The (Common Carrier) **Bureau therefore recommends adoption of the item with the proposed editorial changes.**

Commissioner:

Just what is the ... amplify the place of registration in this continuum of proposals you have before us. Is registration a viable option from the standpoint of what you are proposing today, or not? And if it is, just what role is it going to play in the rights and the roles of the various hierarchy of receive only earth stations?

Staff:

We see registration as the next deregulatory step which might be taken. It cannot be taken here because we don't have the proper proceeding. It would have to be done in a Notice of Proposed Rule Making. This step would essentially be a lessening of the burden on the applicant. It would maintain the protection which presently exists under the licensing program and it would then be an optional program; you would not have to be registered under this...

Commissioner:

I ask the same question the Chairman did. It is not clear whether or not we are going to afford total protection to an interested applicant over a subsequent terrestrial applicant. We haven't made up our minds on that...

Staff:

No, we have not. Commissioner...

Commissioner:

Therefore we cannot today say what kind of protection we are going to afford to the small earth station...

Staff:

That would be the subject of the next proceeding.

Staff:

Commissioner Fogarty, I think as a point of clarification one of the matters that the subsequent proceeding will consider is who can be afforded protection in addition to the degree of protection that might be afforded under a subsequent registration scheme. For example, now, prospectively under the optional licensing program we will permit individuals to license their earth stations as long as they meet the technical requirements and fulfill the coordination (requirements) **as they are required to do under the licensing program. However, under the subsequent proceeding the Commission will want to look at whether we should have certain classes of users who would be entitled to protection and some that would not.**

Commissioner:

What would be the value, if someone decided to follow the option of not getting a license, putting up an earth station and then...what's the downside of just submitting a registration if you are going to afford a frequency coordination subsequently? I don't quite understand why that would be an option. I don't know why anyone would not want to register and then have protection.

Staff:

That's correct. The option of a frequency coordination is a viable asset to a receive only earth station, however there are locations throughout the United States, especially in the mid-west and in the central states where the operator may conclude that frequency coordination is not an asset that he required. Specifically, it may be a dollar amount value which for economic reasons he may elect not to do it. The earth station costs are being reduced quite considerably and the cost of frequency coordination is, again, taking a higher percentage of the total cost.

Commissioner:

That is if you require frequency coordination prior to permitting an earth station to go into operation. The sytem that is described as a potential option of letting it go into operation and then submitting a registration is just putting the frequency coordination behind the operation of the earth station and it

seems to me that you are going to have your glut later rather than now. If that is a viable option with respect to registration and then protection under frequency coordination, I don't see what the real value is other than just dealing with a backlog (of applications).

Staff:

Mr. Chairman, I think that the...again, I appreciate we have a general problem in the sense that we introduce the concept of a registration plan without any real description surrounding it and indicate that the Commission is going to consider this at some point in the near future. I think that part of what that is trying to get at is a very serious concern about what classes of earth stations...receive only earth stations, if any, ought to be entitled to some sort of frequency protection which is obviously a valuable economic asset. And, under what terms and conditions. And it struck us that we didn't presently have the record that would permit us to come to the Commission with any set of proposals that could be adopted along those lines. It is a question that has a great many subtleties connected with it. I would concede there surely is a is a great deal to be feared about any system that would permit somebody to simply send in postcards and capture the economic right to non-interference for any given area.

Commissioner:

Thats exactly why I...it seems to me that a great case is going to have to be made, to me, to justify a system like that. Either you are going to say 'You do it at your own risk and you get no subsequent protection'...and to me that makes sense. But if you say you can subsequently send in a postcard (that says) 'I have just put up this earth station' and have any expectations of protection in the future, to me just doesn't make any sense...

Staff:

Yes, well Mr. Chairman what I think we will do is...we'd be happy to sort of fill in the skeleton a little bit in this present proposed order; but also obviously the Notice we bring up for your consideration later will try in some considerable detail to spell out the various possibilities. The system that is being proposed here is one that has a good deal to recommend it because it is one that essentially gives the consumer its choice about whether or not it is worthwhile, as an economic matter, to obtain this right to non-interference. I think there's a good deal to be said for that; there are interesting questions about eligibility which the subsequent Rule Making proceeding would have to address if we are going to take any finer cut at it than the one that is before you right now.

Commissioner:

I just wanted to say that when Commissioner Fogarty raised this question with respect to registration and the subject of protection, I immediately had this notion that this would not be a viable option. It wouldn't make much sense if that were the case. Because a registration program that afforded subsequent protection just really wouldn't, to me, make a great deal of sense from the standpoint that what we have is status quo.

Commissioner:

So what protection are we going to afford the non-mandatory licensee under this item?

Staff:

None.

Commissioner:

None?

Staff:

None...

Staff:

No, wait a minute. The non-mandatory licensee? The one who chooses to be licensed?

Commissioner:

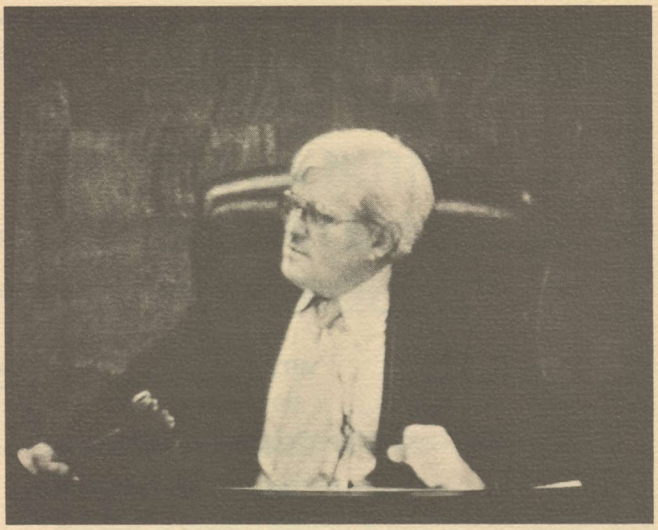
Yes...

Staff:

He will get the same protection we have now.

Commissioner:

Do receive earth stations typically radiate significant spurious RF energy?



COMMISSION CHAIRMAN CHARLES FERRIS opens the meeting ...

Staff:

No sir, none at all.

Commissioner:

What about pirating? Won't this make it easier for that to happen?

Staff:

That's the 605 issue which we discussed late in the presentation. There may be a greater proliferation of earth stations here. However, the only enforcement tool we have taken away here is the option of taking away the license. Any other enforcement mechanism against the piracy will still exist.

Commissioner:

I suppose that encoding and encrypting is the only answer to this...

Staff:

That certainly is an option that is available to the program suppliers.

Staff:

Commissioner, I'd like to agree with that statement very-very heartily. In the final analysis the economics may not be too favorable right now; at this moment. I think that encoding and encryption has got to be the answer from the

STAFF MEMBER JANE MAGO brought the matter formally to the Commission's attention.

SATCOM FI Transponder	Service Name	Fee	Address
1	KTVU	$60 per year	(*) Mr. Al Parinello, Warner Cable Corp., 75 Rockefeller Plaza, N.Y., N.Y. 10019
2	**PTL**	**free**	Mr. Gary Deaner, PTL Satellite Network, Charlotte, N.C. 28279
3	WGN	$60 per year	(*) United Video, Inc., Suite 215, Tulsa, OK 74135
5	STAR CHANNEL	$96 per year	Mr. Al Parinello, Warner Cable Corp., 75 Rockefeller Plaza, N.Y., N.Y. 10019
6	WTBS	$60 per year [*] [**]	Mr. Kip Farmer, Southern Satellite Systems, P. O. Box 45684 Tulsa, OK 74145
7	**ESPN**	**$1.40 one time fee**	ESPN Plaza, Bristol, CT 06010
8	**CBN**	**Free**	CBN, Inc., Pembroke Four, Virginia Beach, VA 23463
9	Madison Square Garden	Unknown	UA-Columbia Satellite Services, Inc., 5 Fir Court, Oakland, NJ 07436
9	C-SPAN	Unknown	C-Span, Brian Lamb 1745 S. Jefferson Davis Hwy., Suite 308, Arlington, VA 22202
10	SHOWTIME (west)		Not available for private use
11	NICKELODEON	part of Tr. 5 rate	See transponder 5
12	SHOWTIME (east)		See transponder 10
13	**TRINITY [KTBN]**	**Free**	Trinity Broadcasting Network, P. O. Box A, KTBN-TV, Santa Ana, CA 92711
16	Fanfare Sports		See transponder 10
17	WOR	$60 per year	[*] Eastern Microwave, 3 Northern Concourse, P. O. Box 4872, Syracuse, N.Y. 13221
18	SIN GALA-VISION	Unknown	Spanish International Network 250 Park Ave., N.Y., N.Y. 10017
20	HBO (spare)		Not available for private use
21	**SPN**	**Free**	Kip Farmer, Southern Satellite Systems, P. O. Box 45684, Tulsa, OK 74145
22	HBO (west)		Not available for private use
23	HBO Take-2		Not available for private use
24	HBO (east)		Not available for private use

***There may be a [controversial] $60 per year "Copyright Fee" to be paid to the Registrar of Copyrights as well; see November CSD. **Pending resolution of the Copyright Fee question SSS is not accepting private home viewing contracts for WTBS although they do have an official tariff on file at the FCC for this rate.**

standpoint of program suppliers if they wish to have any genuine degree of security about the theft of their service. Now, at the margins there may be other things that could and should be considered. But I think that is the only solution; perhaps the only solution that will prove to be altogether adequate.

Commissioner:
Well, since I was one of the ones urging from early on that we go down from our limitation of 9 meters to 4.5 meters, I've got to be for this one. It is the next logical step in the chain and it is a good item and I support it. I suppose this means that the individual user of a smaller...he can go to any size that he thinks will suit his requirements?

Staff:
Thats right Commissioner.

Commissioner:
Thats implicit here...is it?

Staff:
Yes sir.

Commissioner:
I asked the Chairman what he thought about this idea. Would it be preferable to send this item out along with the registration Rule Making?

Staff:
Commissioner, I...particularily, in light of this discussion here this morning, can see a lot of merit to that. There is one

reason I would like to urge that...might counsel going out with this. There are proposals before the Commission...that have been before the Commission for some time...the one I am thinking about particularly is the Mutual Broadcasting System plan for a great many earth stations to provide programming to its affiliates...(and these proposals) **might be held up somewhat longer as a result of any delay here. I wonder if maybe we could compromise on our agreement to very promptly get before you the Notice of Rule Making along with some supplemental language indicating a little bit more about what this registration program might include. And if the Commission agrees with the thrust of this item...trying to get it released sooner rather than later.**

Commissioner:
That's OK...I'm alright...

Commissioner:
May I ask some technical questions, in paragraph 40...are we now going to vote to grant an immediate waiver to everyone without anyone applying for a waiver, of the requirement for a construction permit? The langauge is a little fuzzy to me. It says we will grant an immediate waiver...does that mean when you apply, or are we doing it right now, for everyone?

Staff:
Commissioner, I think the answer is that we are doing it now.

Commissioner:
OK. We talked yesterday about using the word 'voluntary' or something like that rather than non-mandatory. I would like it better...this non-mandatory is sort of strange and I hate clerical strangeness at this stage. Voluntary says an awful lot more to me than non-mandatory. Now ask me why!

Staff
Commissioner...we'd be happy to change...

Commissioner:
Well...I don't want to...

Commissioner:
I take it there is going to be a substantial rewrite to meet some of these points and I wonder if we should circulate it...

Staff:
We'd be happy to do that.

Commissioner Ferris:
OK. The question then is on the adoption of the Report and Order proposing the immediate implementation of voluntary licensing for receive only facilities and completely deregulating unlicensed facilities...all in favor say aye...all opposed no. The aye's have it unanimously. Thank you.

The next item for consideration is the interim Report and Notice of the Inquiry regarding a study of the corporate structure and operating activities of the Communications Satellite Corporation...(and so it ended).

STEVE BIRKILL ON SATELLITE TECHNOLOGY

by
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The Russian System of Geosynchronous Satellies

Readers of 'Coop's Satellite Digest' will by now be very familiar with the kind of satellites that bring TV programming to more than 6,000,000 U.S. homes, either via Cable TV, or direct to a rapidly growing number of backyard experimental home terminals. The North American Domestic Communications Satellites, as they are called, operate at synchronous altitude, 22,245 miles above fixed points on the equator, between longitudes 87° and 1326° west of the Greenwich meridian. This point, or 'orbital station' for each satellite is chosen to make the satellite 'visible' from the area it is to serve, as well as to place it far enough away from its neighbors so that, operating on the same channels, interference is not caused. By visible, I don't mean the satellite can actually be seen from the earth - a spacecraft 20 feet wide needs a mighty big telescope to be seen 22,300 miles away -but that its fixed position is high enough in the sky for the receive terminal antennas to have a clear line of fire to the satellite, unobstructed by trees, buildings or hills at any reasonable distance from the antenna, and clear of the terrestrial thermal and man-made radiations that costitute 'noise' coming from the direction of the local horizon and degrading the very weak 'wanted' satellite signal.

These 'Domsats', comprising the RCA Satcom, Western Union Westar, AT&T Comstar, and Telsat Canada Anik systems, all operate in the 3.7 to 4.2 GHz downlink band (their uplinks are in the range 5.925 to 6.425 GHz) with 12 or 24 transponders, each of 36 MHz nominal bandwidth. A great many of the available transponders carry FM television, either on a dedicated basis or for a large percentage of the time, and again the majority of these TV signals is in standard 525-line NTSC color format, with accompanying audio riding on the video as a subcarrier at 6.2 or 6.8 MHz. And over the North American area the signal level from every transponder on every satellite doesn't vary by more than 3 or 4 dB above or below an average value of about 34 dBw. Boring? Predictable? Not a bit of it, as anyone reading this will be fully aware. But after a while it may occur to those of an enquiring or adventurous spirit that much of the appeal of direct satellite TV is in the capturing of the extremely weak signals over immense distances with one's own antenna, rather than in the vastly expanded TV programming they provide. So the experimenter, the enthusiast, sets his horizons wider than the number of ball games or first-run movies he can choose from at any one time. In this CSD segment I shall try to inform the experimenter about the other satellite services he or she can seek, outside the American Domestic systems, and present some practical ideas, as well as just a bit of relevant theory, to help in their reception.

In straying outside the 87 to 136 degree west zone we immediately meet diversity rather than uniformity. Suddenly we have a wide range of different signal levels and transmission formats, some similar and some very different to the domsats. So we can expect to have to make some small but necessary changes to our receiving gear to accomodate them.

But fear not - the changes **are** small, and most can be incorporated as switched additions to the existing set-up, so as not to affect 'regular' reception.

So what is there out there? Well, there are other domestic satellite systems also employing dedicated birds, there are regional and global international telecommunications systems. And there's lots of TV. The global communications satellite system, INTELSAT, has a series of satellites stationed over the three main ocean regions, Atlantic, Pacific, and Indian, which carry most of the internal TV, telephone and data traffic, as well as leasing part of their capacity to individual nations for their own internal communications and TV program distribution. (it will be realised that Indian Ocean satellites are out of view from the USA, but I shall make reference from time to time to satellites world-wide, since CSD readership has an international component.) A second global system, Intersputnik, is being set up by the USSR for use by members of the communist bloc. The Soviets see Intersputnik as a rival to Intelsat, offering satellite services to the developing countries, and providing **civil** communications to communist outposts on a global basis. (The Russians, like the West, have their own systems of satellites for military communications.) But easily forgotten is the fact that the Soviet Union had the world's first domestic communications system, Orbita, beginning in 1965 and in continuous use today. In this issue I shall describe these two Soviet systems.

Orbita

Back in the early 1960s the Russians wanted to exploit their newly-developed satellite-launching technology for wide-band communications. In particular they needed a means of carrying Moscow television thousands of miles out to the far-flung communities in the Arctic regions and Siberia, and also of enabling the state newspaper, Pravda, to be printed simultaneously at various centers throughout the Soviet Union. Terrestrial communications were very poor and narrow-band, in the main being confined to voice or telegraphy channels, and circuits capable of carrying video would have been extremely costly to install to all the desired destinations, as well as taking many years to complete.

Satellites were the answer, but a suitable orbit had to be chosen. Most of what had previously been flown were in low orbits around 200 miles in altitude, having the disadvantage that mutual visibility from up- and downlink terminals would have been limited to less than 30 minutes, with the requirement that antennas would have to track the satellite continuously from horizon to horizon at several degrees per minute. Clearly to provide continuous coverage required a large number of satellites spaced along the same or similar orbits, with two steerable antennas at each terminal. Also complete coverage of the Soviet Union would not be possible without multiple hops.

The advantages of the 22,300 mile circular equatorial geostationary orbit were already known - prophetic writer Arthur C. Clarke had proclaimed its possibilities back in 1945 - but the Russians were unable to use it in 1965 for two reasons: their launch vehicle technology was not sufficiently well developed at that time to lift a communications payload into the correct orbit, and, the 45°N latitude of the Baikonur Cosmodrome at Tyuratam meant an extra heavy launcher was required to shift the plane of the orbit into that of the equator. Additionally, the need to serve stations north of the Arctic Circle indicated against an equatorial satellite: above 76°N, elevation angle would be too small to give sufficient ground clearance; above 81°N the satellite would not be visible at all - and this for the most favourable case of both terminals on the same meridian of longitude as the satellite.

The orbit chosen for the Orbita system was highly elliptical, having apogee of 39,300 km in the northern hemisphere and perigee of 538 km in the southern. Orbital period is close to 12 hours, but by giving the orbital plane an

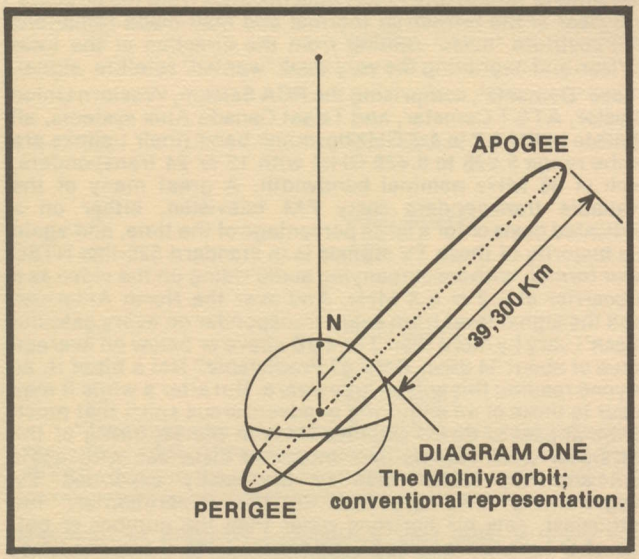


DIAGRAM ONE
The Molniya orbit; conventional representation.

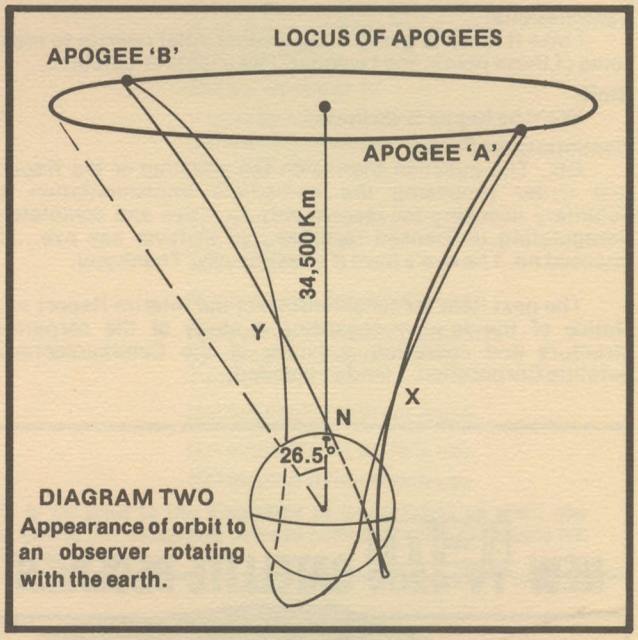


DIAGRAM TWO
Appearance of orbit to an observer rotating with the earth.

Diagram 1 shows the 63.5 degree [approx] inclined elliptical orbit used by Molniya satellites serving the Orbita system. The special features of this orbit are only revealed if it is redrawn as in Diagram 2, showing how the satellite moves with respect to an observer rotating along with the earth, as most satellite earth terminals are constrained to do. It can now be seen that, to a northern hemisphere observer, the satellite doesn't move over a very large area of sky between passing crossover point X going northward, through apogee A, and back to crossover point X going south. And that is the slowest part of the orbit, taking 10 hours. Similarly between point Y and apogee B, 180° removed in longitude. So for stations in view of apogee A the satellite is available for something like 10 hours out of 24, the 10-hour period occurring at the same time each day. The locus of the apogees of all possible such orbits is a circle with its center on the earth's axis, 34,500 km directly above the north pole. This circle, though not itself a possible orbit, can be likened to the familiar geostationary orbit in that positions can be assigned along it to satellite systems, spaced apart on a non-interference basis. The phasing of satellites along adjacent orbits can be seen as analogous to the operation of low-inclination geosynchronous orbits, as used by Gorizont. The Molniya type orbit could serve instead the Antarctic regions, by having its apogee arranged to be in the southern hemisphere. I am unaware of any satellites in such an orbit.

inclination of 63.5°, synchronism with the earth's rotation was achieved. The effect of this was to place every **second** apogee point above the same place on the earth's surface. For a period of 5 hours either side of this apogee, the satellite appeared to remain within a few degrees of the apogee point, in the observer's sky, as its orbit kept pack with the earth's rotation. Outside this period, it would sweep away to its perigee in the southern hemisphere. Since apogee occurred over 63.5°N, the point was visible right over the north pole and the desired area could be covered. The characteristics of the orbit meant that with 3 satellites equally spaced, 24-hour coverage was achieved.

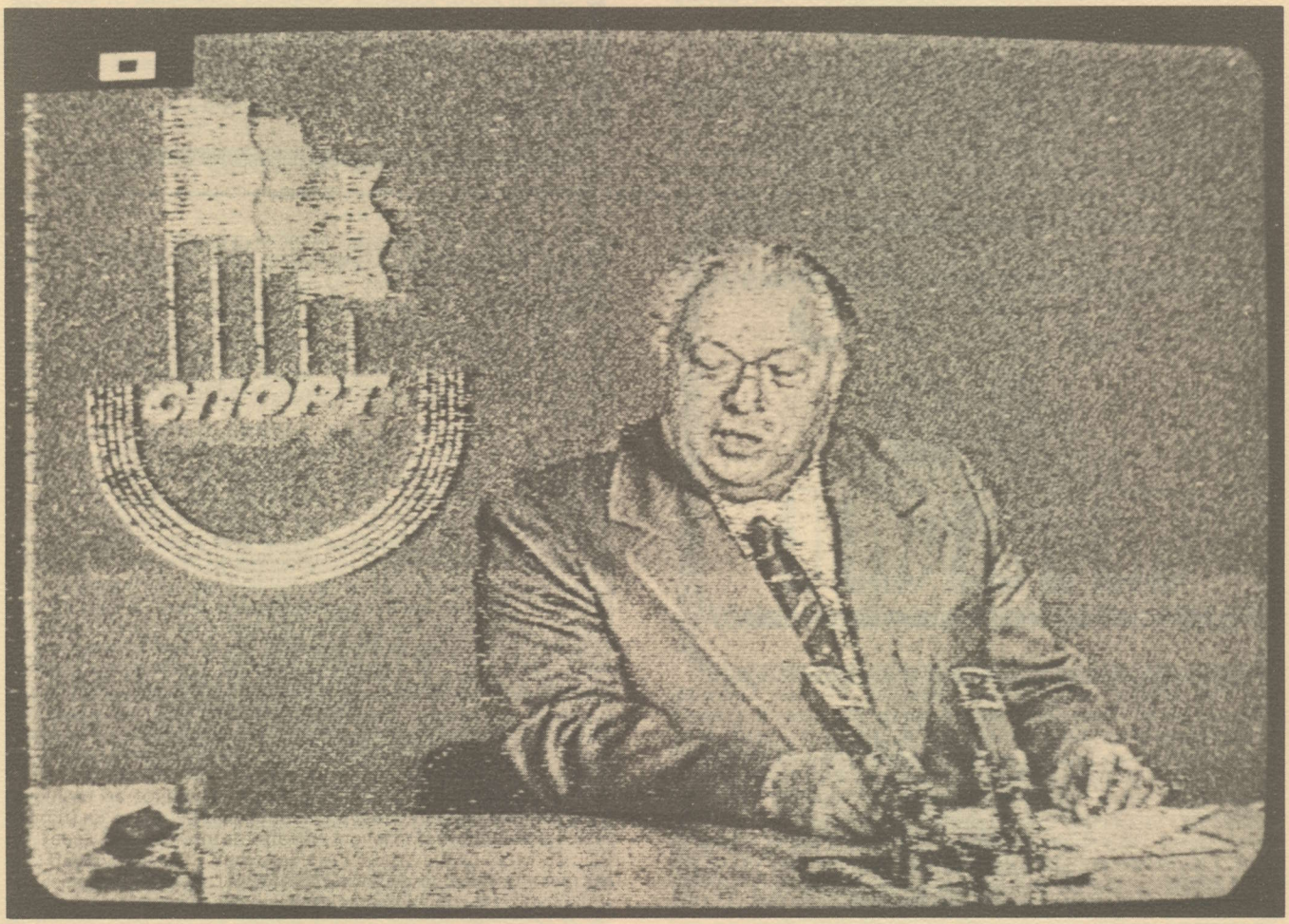
It was into this orbit that Molniya-1A was launched in April 1965, to be followed by several similar satellites over a period of a few months. The Molniya-1 type satellite (Molniya means lightning) is a conical cylinder of 3.4m length and 1.55m diameter with 6 deployable solar panel arrays extending from its base, windmill-fashion. Three-axis stabilised, the spacecraft carries a par of 0.9m dish antennas giving visible-earth coverage at 800-1000 MHz. 40W TV transponder power gives 31 dBw EIRP at beam-edge, a healthy signal at UHF.

The capacity of the Orbita system was increased in 1971 with the introduction of the Molniya-2 series, operating in our familiar 6 GHz uplink, 4 GHz downlink band. At first the series 2 birds were interleaved with series 1, two of each maki ng a set of four on each orbit, compared with Molniya 1's original three. Subsequently the series have gone their separate ways, with several sets in simultaneous operation in spaced orbits. Molniya 3's were introduced in 1974 with further increased capacity. With an operational life of some five years, over 70 Molniyas have now flown. The Orbita receive-only terminals are equipped with 12-meter antennas, and feed cable systems or rebroadcast transmitters. Aroudn 100 Orbita receiving stations are in service in the Soviet Union.

Intersputnik

The Russians achieved geostationary orbit capability in 1974 for communications satellite payloads. Launch capability was tested with the Cosmos 637 and Molniaya S1 flights, after which the geostationary program commenced in earnest. To date three classes of geosynchronous comsat have entered service: Raduga (rainbow) is geostationary, operates at 4 GHz downlink frequencies and within Intersputnik; Ekran (screen) is also geostationary but is a direct-broadcast TV satellite in the UHF band; Gorizont (horizon) is the most recent addition and, while geosynchronous it is not truly geostationary, in that its orbit traces out a figure-8 ground track about a fixed point in the sky. The Raduga and Ekran spacecraft are given flight numbers, and once in orbit they are re-assigned a Statsionar (stationary) number according to their orbital position. Thus for example Statsionar-2, at longitude 35°E, was initially Raduga-2. When that satellite reached the end of its operational life, it was replaced by Raduga-4 still at 35°E and still designated Statsionar-2.

The situation is complicated by the fact that Raduga-2 appears to have initially designated Statsionar-1B, and the possibility that Raduga-3 also played the Statsionar-2 role.



SOVIET SATELLITE TELEVISION received by Steve Birkill in Sheffield, England from Statsionar-4 located at 14 degrees west over the Atlantic. Frequency in 3,845 MHz. Program is sports news and reception was this past September. Birkill 4 GHz terminal uses only an 8 foot dish and 180 degree K LNA indicating that the same satellite, well above the horizon for eastern U.S. and Canadian observers is a good 'target'.

Information is sparse, and there is more to be discovered, but the situation as I understand it at present looks something like:

Satellite	Statsionar designation	Longitude	Launched	Out of Service
Raduga-1	Statsionar-1A	80oE	Dec. 75	Mar. 78
Raduga-2	Statsionar-1B	35oE	Sept. 76	Nov. 78
Raduga-3	Statsionar-2	35oE	July 77	
Raduga-4	Statsionar-2	35oE	July 78	
Raduga-5	Statsionar-1 or -3	80oE or 85oE	April 79	

In recent months it appears that the **Statsionar-4** position at **14oW** (over the Atlantic) has become occupied, but without a Raduga-class launch to account for it, so it may be that information on Radugas 3, 4, and 5 is incorrect, or that some changes in orbital station have been made. The most feasible solution to be (though it's just a guess) is that Raduga-3 occupied the Statsionar-3 position, Raduga-4 the Statsionar-2, and that Raduga-5 is the new Statsionar-4.

Satellite	Longitude	Statsionar designation	Launched
Ekran 1	99oE	Statsionar-1C	Oct. 76
Ekran 2	99oE	Statsionar-T	Sep. 77
Ekran 3	55oE	Statsionar-5	Feb. 79

If anyone can help to clarify the confused Statsionar information, or confirm frequencies in use by the various series I would be most grateful and would gladly publish their findings.

Future Statsionar slots, due to be activated in 1979/80, are as follows:

Statsionar-6	85 or 90°E	Indian Ocean
Statsionar-7	140°E	Western Pacific
Statsionar-8	25°W	Atlantic
Statsionar-9	45°E	Indian Ocean
Statsionar-10	170°W	Pacific Ocean

It is believed that these will be occupied by a Raduga-type payload, but there remains the possibility of a more advanced higher-capacity satellite being employed.

In the next issue I shall conclude this survey of the Soviet satellites with a look at the channel frequencies used and how to receive them, as well as coverage zones and antenna-pointing angles.

ATTENTION COMPONENT SUPPLIERS

CSD readers with an active hand in the business of supplying innovative microwave hardware parts are encouraged to offer 'sample/engineering sample parts' to contributing editor Steve Birkill in Sheffield, England. Birkill's contributions to the development of hardware for both the 4 GHz TVRO terminals and the new 11/12 Ku band terminals is a matter of record. However, innovative components are difficult to acquire in the U.K. and are often a generation behind those available here in North America. Suppliers interested in seeing their latest 4 or 11/12 GHz components blossom forth into useful microwave satellite TV hardware will do well to place Birkill high on their 'sampling engineer' priority list for both existing and new component parts. Naturally projects developed by Steve end up being published here in CSD

SPTS 80 MIAMI

THE BIG EVENT!

The second international Satellite Private Terminal Seminar (or SPTS for short) scheduled for February 5, 6 and 7 at the Miami (Florida) Bayfront Park Auditorium is well on its way to setting new records in attendance and new technology.

The first SPTS, held this past August in Oklahoma City, drew more than 500 registrants with several hundred additional 'would-be' participants turned away by the full house status. The facility in Miami will handle nearly twice as many people with much larger exhibit facilities **but** there are clear indications that the capacity of the auditorium will be strained. **Pre-registration is mandatory!**

SPTS '80 Miami will be conducted along lines proven successful in Oklahoma. There will be parallel sessions with a 12 lecture symposium delivered by H. Paul Shuch in one area of the auditorium simultaneous to roughly an equivalent number of sessions in the main auditorium. Shuch will be concentrating on teaching TVRO receiving system fundamentals to those with a technical interest in exactly how the system works and why certain design applications are followed. Paul intends to update his August SPTS presentation by bringing attendees into the world of 1980 style "$1,000 home receiver designs". Shuch is one of those that believes the engineering community will solve the problems presently separating the viewing public from under $3,000 terminals by the end of 1980.

In a similar technology breakthrough area, hardware developers Taylor Howard and Robert Coleman have been conspiring to create a single refined system for taking the 70 MHz i.f. output (from either a single conversion 4 GHz to 70 down converter system, or, from a double conversion system) and turning it into baseband audio and video. Coleman has worked out a very inexpensive 50 dB gain region i.f. stage board using around $25 of active devices and Howard and Coleman together have completed design work on getting you from 70 MHz down to a good quality baseband pair of outputs. They will be showing and explaining the system in Miami, and they plan to have circuit boards for the builders as well as boards with parts kits and possibly even completed units available by Miami. Combining this 70 MHz to baseband package with Coleman's GaAs-FET front end and active mixer (with the Avantek VTO 8360 VCO), a chap will have a high quality and low cost receiving system.

We expect to see **many** new antennas at Miami. Numerous 10, 11 and 12 foot antennas that have not previously been seen are now rolling out of proto-type shops all across the country. One of the most interesting is an 11 foot petal-bolic that utilizes 24 metal petals to achieve a parabola of revolution. The petals ship via UPS and the 40 pound hub is now being slightly reconfigured so it too will ship via UPS. The user price on this package, which has around 0.75 dB more gain than a 10 foot dish with a 0.4 f to d ratio, is in the $2,800 range. Those who have seen this particular antenna say it looks exactly like a Scientific-Atlanta 4.5 or 5 meter parabolic; except miniature in

FIRST CUT — SPTS '80 / MIAMI PROGRAM SCHEDULE

Here is the Miami program schedule as it shapes up late in November. An updated version of this program schedule, to assist you in making your own arrival and departure plans, will appear in the January issue of CSD.

Time	Tuesday, February 5th		Wednesday, February 6th		Thursday, February 7th	
	Main	Shuch	Main	Shuch	Main	Shuch
8AM-8:50		Videotape		Videotape		Videotape
9AM-9:50	Basic Syst. Language	Spanish - Behar	Taylor Howard	Spanish - Behar	LNA Art	Low Power Relays
10-10:50	FCC Dereg.	Shuch #1	Robert Coleman	Shuch #5	Whats On The Bird?	Shuch #9
11-11:50	License Or Not	Shuch #2	Copyright Status	Shuch #6	Competitive View	Shuch #10
12N-1:45	**Exhibit Hall Open**		**Exhibit Hall Open**		**Exhibit Hall Open**	
12:30-1:30		Videotape		Videotape		Videotape
2PM-2:50	Distributing TVRO Gear	Shuch #3	Oliver Swan	Shuch #7	Business Opportunities	Shuch #11
3PM-3:50	Marketing Experience	Shuch #4	MDS Inter-connect	Shuch #8	The Year Ahead	Shuch #12
4PM-6PM	**Exhibit Hall Open**		**Exhibit Hall Open**			
4:30-8PM				Videotapes		
6PM-8PM			**Exhibit Hall Open**			

size. It cranks through all of the satellites with ease. This particular manufacturer has a capacity of 10 per day which will certainly help put a dent in the delivery problems now being experienced! Another low cost fiberglass antenna series is also going to be shown in Miami; in both 10 and 16 foot sizes. The price is the interesting thing here; around $600 we are told for the 10 foot version.

As exciting as the new hardware is bound to be, the biggest attraction will probably be the direction that programming and programmers are now going. With more and more video activity appearing on the COMSTAR birds, and with each COMSTAR bird holding the capacity to place a 35 dBw or so footprint over the Caribbean, Central America and Northern South America, interest in first-time-television in that part of the world (or first direct English speaking television from North America) is running very high. SPTS '80 Miami will have three sessions pointed at the enthusiast from this portion of the Western Hemisphere; two of which will be conducted largely in Spanish by Bob Behar of A-B Electronics in Hialeah. Behar's sessions will concentrate on "Latin America Satellite Opportunities" (i.e. what signals are available, what equipment is required) and on "Low Power/Low Cost UHF Re-Broadcasting Techniques" wherein he will explain how 10 to 100 watt UHF TV range transmitters can be utilized to re-deliver satellite received signals over a region 5 to 20 miles across. Behar's technique provides for security so that unauthorized viewers cannot tap into the system. Another session, in English no less, conducted by Coop will explain how 2.15 GHz MDS systems can be put into service in remote U.S. areas to delivery satellite programming to paying customers, as well as covering use of 10 GHz range low power / low cost microwave for interconnection of such facilities (where authorized by law).

Early marketing experience, at the national, regional and local level will also be a big part of the program. Since SPTS '79 in Oklahoma last August, hundreds of private terminals have been sold and installed. A panel of people with experience in marketing to the public will illustrate what works and where the pitfalls of selling satellite TV hardware are and how to avoid them.

Oliver Swan will be on hand to conduct another seminar session; he plans to have a trailer mounted Spherical antenna on display and will be talking about how the Spherical in its larger forms can be utilized in the Caribbean and south of the U.S.A.

The SPTS '80 Miami program is now starting to take shape and a 'first cut' of the program appears here this month in table form. An updated version of this will appear in the January CSD.

The increased emphasis on business opportunities in satellite television, at SPTS '80 / Miami, shows that the industry (as young as it is still) is maturing at a rapid rate. The opportunity to be successful at virtually every level exists in this field and all of this and more will come into focus at SPTS '80 Miami where the seminar session teachers, the exhibitors and the attendees will get together to update this explosion in technology!

SYSTEM PACKAGING NEWS

PROFILE OF A SATELLITE NUT

Channel One Inc. (68 Avalon Rd., Newton, MA 02168), the Fred Hopengarten managed firm that is touting $18,000 range private earth terminals for those affluent enough to think seriously about such things, recently conducted a marketing study of just who the person is that has been attracted 'early-on' to the satellite TV field. Bob Cooper provided Fred with 50 very randomly sampled names from persons ordering the 'Satellite Study Package' this past late winter. To these 50 geographically separated people Hopengarten sent out a two page, 10 question marketing questionnaire. To the surprise of Hopengarten and Coop, Fred received 35 responses (70%) and he offered no prizes or inducements!

We present the tabulated results of this study primarily because it offers some insight to those people attracted to satellite TV in its early stages in the first quarter of 1979. Remember please...this was **before** a) SPTS '79, b) Taylor Howard's Manual, c) Robert Coleman's Manual, d) Oliver Swan's Spherical antenna breakthrough, and prior to virtually all of the popular press coverage of this subject. See how you fit into the group!

The sampled group already owned: 1) Stereo gear (100%), 2) Wide Screen TV (23%), VTR machine (57%), CB Radio (46%) and Ham/SWL radios (54%). Additionally, although no check off line was provided 6% said they owned TV games, 17% own computers and 3% said they owned sail boats (!).

Of those responding, 86% owned (or assumedly were paying towards) their own home, and the balance (14%) were renting.

Could a three meter parabolic antenna be placed in their backyards? 91% said yes, 9% no.

Could a three meter parabolic be placed on their roof? 66% said yes (probably before they checked the roof joists!) and 33% said no.

Of those responding that they could either place an antenna in their backyard **or** on their roof, 91% indicated they had a 'clear view of the southern sky' at the applicable 'look angle'.

Would they be prepared to spend up to $18,500 to own a satellite TV receiving system? 4% said they would, 96% said they would not.

(Note: Four percent of the total U.S. marketplace of 65,000,000 homes would still be a substantial market for $18,500 terminals. However, the group can hardly be considered typical with such a heavy advance interest in expensive electronic toys as is evident. The real market for $18,500 terminals is therefore substantially smaller than the 4% indicated.)

How would they rank, in importance, the satellite TV programs which they most would like to watch? There were eight categories in all and here is how they shaped up:

Number One - Movies
Number Two - News (Ted Turner will love that!)
Number Three - Sports (can you believe news beating sports? This is no typical Archie Bunker group!)
Number Four - PBS (as in educational and cultural)
Number Five - Super Stations (after PBS no less!)
Number Six - Religious Programs
Number Seven - French Programs
Number Eight - Spanish Programs

Where are these people located? 44% said they lived in the suburbs, while rural area (28%) and city (28%) tied for second place.

What about cable TV? 46% said it **was** available in their area. Of those who have it available, 69% subscribe to the service.

Without cable TV, 15% said they receive 3 or fewer off-air stations while 36% have 4 or fewer stations (none received no television).

Having established that only 4% were willing to consider an $18,500 earth terminal, what about easy credit terms? Hopengarten found that stretched over a four year payout period:

80% of those responding were willing to take on time payments, and of those, 45% were willing to pay less than $200 per month (no way of knowing **how much** less!), 39% were willing to pay $250 per month and 6% were willing to pay $300 per month. Just like buying a new car.

And an aside. Many of the respondents took the time to tell the survey takers that they were intent upon building their own terminals. Which is understandable when you consider that all of the early enthusiasts were in fact people who learned of such goings-on primarily through technical trade journals.

So what was the profile of the typical early enthusiasts in satellite TV reception? Well, he (or she; the survey didn't separate the two):

1)Was into electronic gadgets in a big way
2)Owned or were buying their own home
3)Could put a three meter parabolic either in their yard or on their roof
4)Had a clear shot at the southern sky
5;Were **NOT** willing to plunk down $18,500 for a TVRO terminal
6)Wanted movies, news and sports in that order from the satellite
7)Lived in the suburbs
8)Did **not** have cable TV available
10)Were willing to put down something less than $200 a month over 48 months for a TVRO in their yard.

How about it? Does that describe you?

'MOBILE' TVRO SYSTEMS

The popularity of mounting a 10 (or even 12) foot parabolic antenna with 3.7 to 4.2 GHz feed on a trailer, connecting it to a suitable pull vehicle and setting out to demonstrate to the world 'direct' (home) satellite television reception is growing by leaps and bounds.

In Canada, pioneers David Brough and John Kinik are criss-crossing the northern reaches of that country with both flatbed truck and trailer mounted units displaying what amounts to first-time television to dozens of remote Canadian mining, lumber and other (work) camps. As a separate article appearing here this month notes, the appearance of these mobile terminals plus the U.S. television reception they are bringing into Canadian communities is creating quite a stir in Canada.

In the United States numerous trailer rigs are now on the road. The **USTC** (P. O. Drawer S, Afton, OK 74331) 12 foot antenna is now being delivered to 'installing distributors' such as Robert L. Young's Satellite Television Systems (shown here while visiting at the **CSD** Lab near Oklahoma City). This 12 foot all aluminum array carries a distributor price tag in the $2100 region for the antenna (and feed) while the trailer portion of the rig is priced in the $1600 region. These are **not user prices**; rather they are installing distributor prices. The USTC rig is

equipped to travel down the road as you see it; 'stowed' to the side but fully assembled. Young who had hauled it around 300 miles by the time he arrived at CSD's Lab, reported that he wouldn't want to go around bucking strong side winds but with normal weather he was having no difficulty pulling it along at the legal limit. You have to be careful of 13'6'' clearances however!

Out in California, Microwave General (2680 Bayshore Frontage Rd., Mountain View, CA 94043; 415-969-3355) first displayed their ten foot trailer mounted terminal at the San Francisco WESCON show reported in the October issue of CSD Chuck Colby of MG reports the trailer mounted rig, set up on a downtown San Francisco street corner, was a real show stopper with hundreds of people crowded around at times. MG is now offering not only the 10 foot diameter Cassegrain fed antenna but also complete turn key systems. They have packaged a Dexcel 150 degree LNA and the International Crystal receiver into a $6,900 (user net) turnkey price for west coast installation; plus, they have packaged the AVCOM PSR-3 receiver plus a 120 degree LNA and super satellite nut version of the same antenna into a $9,900 (user net) priced package. Chuck reports that there are as many takers for the more expensive package than the lower cost version with installations now in or going in spread from Lake Tahoe to southern California.

The $9,900 priced package has a very clever antenna control system that includes the usual polarization rotation plus automatic (user controlled) azimuth and elevation controls with digital (three digit) read out of the antenna's position at anytime. The user simply runs a couple of small controls at his viewing location and adjusts the antenna heading, polarization and the receiver all from one spot remotely.

MG will be announcing a new 12 foot antenna for those weaker signal areas about the time you read this and Colby reports that with expansion of their production facilities now nearly completed they can turn out a complete antenna in about four hours time.

MG's Colby feels their $9,900 package is in direct competition with the more expensive systems offered by Scientific Atlanta and others and describes business as 'brisk'.

USTC 12 FOOT MOBILE RIG with Reno's Robert Young.

Canadian Report On Pirate Terminals

The total failure of the Canadian authorities to grasp the need for live, quality television in Canada's far north has spawned a proliferation of unlicensed satellite TV terminals across remote portions of Canada. Canadian law restricts Canadian viewers from tuning in U.S. satellites but Canadian satellites offer very little in the way of desirable television to these Canadians. Naturally those Canadians with the dollars or knowledge to do so are installing private terminals to tune in the U.S. SATCOM and WESTAR signals. This newspaper report, from a recent Canadian edition, addresses the question of what is bing done (or threatened) as the battle lines heat up in Canada. Keep in mind this is a layman's report appearing in a general circulation newspaper so if something of the fine 'details' don't quite jive, that is understandable.

''CTV Network Ltd of Toronto may seek an injunction against illegal television oeprators in the North by the end of the year unless the federal Government takes action to stop the operators.

John Coleman, CTV director of government and industry liaison, said the private network is thinking of taking legal action to have equipment seized so that broadcasting from so-called 'earth stations' will be stopped.

''Referring to the burgeoning number of illegal receivers, many of them dish-like units that pull in signals from a satellite owned by RCA Corp. of New York, Mr. Coleman said: 'It is a disgrace. The number of these dishes, or TVROs, is irrelevant. The Government is tolerating anarchy as long as it permits this to continue.'

''Bernard Ostry, deputy minister, Department of Communications, said it is 'relatively well known that there are illegal earth stations operating in the North.'

''While no one knows the exact number, Mr. Ostry said he places the total across Canada at between 60 and 70. However, Mr. Coleman said he knows that David Brough, owner of Northern Access Network of Orillia, 'now says he is operating in 50 locations.'

''Mr. Coleman said Mr. Brough's operation, without licensing from the Canadian Radio-Television and Telecommunications Commission, is 'only a case in point. The fact that no network serves some of these communities does not justify the piracy that is going on.'

''Mr. Ostry said most of the stations are in and around the Yukon, 'primarily in mining camps. They range from tiny systems to large ones. Many of them felt the CBC was not giving them the choice they wanted.'

''All of these systems, he added, contravene either the Broadcasting Act or the Radio Act.

"It's a new problem and the solution to it, while it is being addressed, has not been found. There are ethical and moral questions around removing them. I suppose I could enforce the law, but I don't think that achieves very much.'

"Referring to the fact many of the illegal systems are using the U.S. satellite, Mr. Ostry said the international problem would 'expand in the future. The whole question of spillover to other people's satellites is touchy. For 11 years the United Nations has been trying to deal with the implications of direct satellites and has not yet come up with a solution.'

"Mr. Ostry mentioned earlier the problem of negotiating the issue with foreign countries 'when we haven't served the users ourselves with the same choice of signals. Sending in people to close things down is not the answer.'

"No viable alternative has yet been worked out by the Government for people using the systems, Mr. Ostry said. He ruled out a simple private sector solution.

"That becomes a question of who will deal with those 60 or 70 antennaes in the north, who will pay $1-million to beam the signal up to a few thousand people?'

"He said one option under discussion is a package deal with pay-television that could attract other uninterested private companies to provide the service.

"One member of the communications industry offered to supply Report on Business with instructions on how to build a small-sized, TVRO, or dish, it's simple. You just go into an old air force store on Toronto's Church Street, buy a discarded parabolic reflector and discarded receivers, and you can modify the whole works for less than $25.

"The obsolete electronic gear disposed of by the army, navy and air force sells for peanuts. Blueprints are available in the U.S. for $2.50.'

"The same source said the lumber and mining camps use the 'big dish,' about 20 feet in diameter. 'They are getting 20 channels from the RCA satellite, much of it pay-TV for other people.''

PROGRAMMING SERVICE CHANGES & ADDITIONS

HAWKS WTBS SCHEDULE

The Atlanta Hawks NBA basketball season has begun a 40 game series telecasting season on Atlanta's Super Station WTBS. Televised games remaining in the schedule follow:

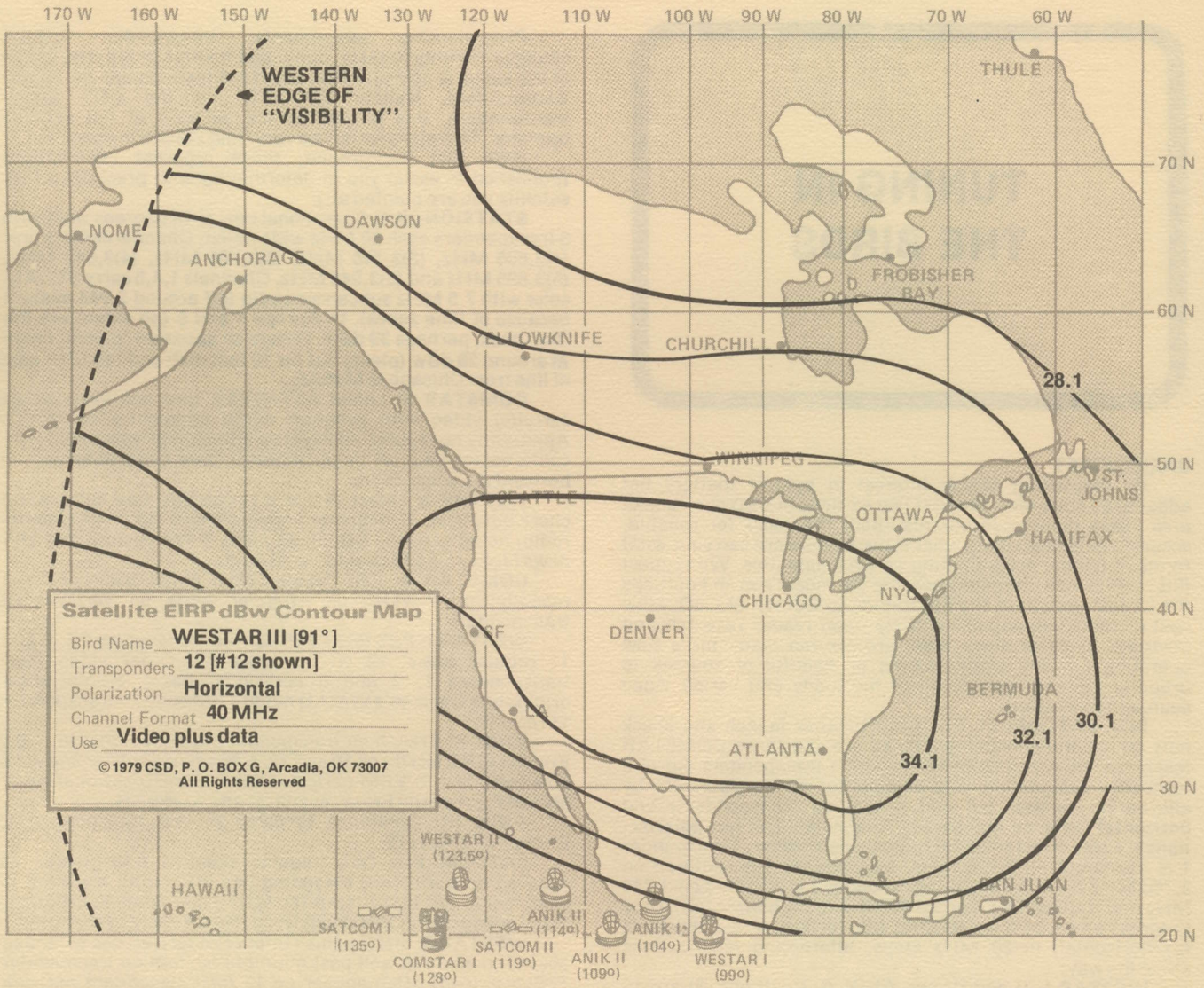
DAY	DATE	TEAM	EASTERN
Sun	12/ 2	Cleveland Cavaliers	7:30PM
Wed	12/ 5	Boston Celtics	7:30PM
Sat	12/ 8	Washington Bullets	8:00PM
Sun	12/ 9	New Jersey Nets	7:30PM
Fri	12/14	Philadelphia 76'ers	8:00PM
Tue	12/18	New York Knicks	7:30PM
Thu	12/20	Detroit Pistons	8:00PM
Sat	12/22	Indiana Pacers	8:00PM
Fri	1/11	Boston Celtics	7:30PM
Sun	1/13	San Antonio Spurs	8:30PM
Wed	1/16	San Diego Clippers	10:30PM
Thu	1/17	Phoenix Suns	9:30PM
Fri	1/18	Los Angeles Lakers	11:00PM
Tue	1/22	Kansas City/Omaha Kings	9:00PM
Thu	2/ 7	Utah Jazz	9:30PM
Sun	2/10	Golden State Warriers	5:30PM
Tue	2/12	Portland Trail Blazers	11:00PM
Wed	2/13	Seattle Super Sonics	10:30PM
Fri	2/15	Denver Nuggets	9:30PM
Tue	2/26	Boston Celtics AT HARTFORD	7:30PM
Fri	3/ 7	Indiana Pacers	8:00PM
Sat	3/ 8	Houston Rockets	9:00PM
Tue	3/18	New York Knicks	7:30PM
Wed	3/26	Philadelphia 76'ers	8:00PM
Fri	3/28	Washington Bullets	8:00PM

BIRD OPERATIONAL NOTES

Twelve hour per day **WESTAR III** movie and entertainment service aimed at 'off shore oil rigs' and other expatriot Americans living away from U.S. mainland is scheduled to begin January first. Firm bringing up service, first of an 'entertainment/direct-view' nature on any WESTER bird, is **Video Communications, Inc.** (VCI, 6585 E. Skelly Drive, Tulsa, OK 74145; 800/331-4077). VCI President Bill Blair reports they will select actual transponder on WESTAR III sometime in December; he is purchasing non-preemptible service (i.e. 24 hour per day, last-to-go class service) and service will be 'scrambled'. VCI has been soliciting bids for total of 500 terminals (3 to 6 meter class) to be purchased first of the year. VCI will supply complete packages to clients and rate structure looks like $.25 per person per day for service. Initial uplink will be from Dallas area WU site but VCI plans to build their own uplink in Tulsa in mid-1980. The firm is also talking, through Western Union, with INTELSAT about plans to provide 3 to 4 hours per day of U.S. TV service in English (using 1/2 transponder format) to Americans residing in North Sea area (oil rigs primarily) as well as Middle East and North Africa. Blair is obviously courting (money rich) oil firms looking for way to create market of his own. He doesn't rule out customers taking his service in Caribbean, Central or South America(plus on mainland U.S.A. at remote lumber camps, etc.) and notes WESTAR III has excellent footprint as far south as Mexico City . Extra bonus for users will be a pair of Tulsa radio stations to be sent along on subcarriers. Tulsa station KVOO (country and western) and KRAV (middle of road and pop music) are strong contenders right now.

Last spring's **transponder 1 interloper** has returned. Incident in early 1979 involved strangely modulated carrier that RCA, FCC and others never did pin down. Effect is white flash rolling through KTVU video at random rate. Best theory at time was interference was mis-directed uplink antenna although 'deliberate interference' theory ran close second. Random dates in early November (including the 6th) had the problem.

Open market source of weekly movie (etc.) program schedules for HBO, SHOWTIME and other premium source



NEW WESTAR III SERVICE - footprint data from official FCC contour maps. Satellite will carry new VCI 12 hour per day movie/entertainment programming for off-shore oil rigs, remote lumber camps, etc. starting January 1, 1980. Although not shown here, service contour at 26.1 dBw level extends into southwestern tip of Greenland including Godthaab, Fredrikshaab, Sydproven. Mexico City level is in 24.1 dBw region. Northern South America [including Venezuela] is far below 24 dBw.

has turned up; **TV GUIDE**. New York City metro edition of newsstand publication now carries HBO, SHOWTIME and Madison Square Gardens. Since anyone may subscribe to any edition ($18 per year from TV GUIDE, Box 400 Radnor, PA 19088) the 'challenge' of finding premium program listing now seems to be resolved for those who are anxious to 'pirate' satellite TV premium offerings. One source reports there has been an increase in 'distant subscribers' to the New York City (metro) edition at TV GUIDE since the premium program listings were added.

RCA now asking FCC for permission to build **SATCOM V** as on ground 'spare'. RCA says they plan use of four primary satellites as follows: **SATCOM FI** (136 degrees - after FIII launch) for cable (11 transonders), Alascom; **SATCOM FII** (119 degrees) Alascom, interstate TV, government data and voice; **SATCOM FIII** (132 degrees) CATV only; **SATCOM IV** (83 degrees, launch 1981) SMARTS (TV broadcaster program feeds), government and commercial traffic.

Some of the new SATCOM users after FIII is launched are starting to be evident. Included is Pittsburgh's **Total Communications System** feeding sporting events (mostly on an event basis; they've been sharing transponder 20 on FI for more than a year), **National Christian Network** (new 24 hour per day religious programming service; the fourth such service) will be on transponder 4 on FIII. Further announcements or 'leaks' will be closer to operational date in February.

Deregulation of receive-only-terminals has re-activated **Mutual Broadcasting's** plans for 650 audio terminals. They say now they will use antennas in 2 (**two!**) to 4.5 meter range depending upon footprint and interference. Mutual expects first terminals installed by January. De-regulation has also prompted some smaller CATV systems to install 4 meter size antennas. **USTC** of Afton, Oklahoma reported it had delivered first such antennas only days after FCC deregulation to cable systems in Georgia and Oklahoma.

FCC issued statement as to 'prior authority' requirements for **licensed** TVROs. If licensee has license covering any bird in operator **family** (such as SATCOM, WESTAR, COMSTAR), no need to get license modified to add additional bird within **same family**. However if system is licensed only for one family, license must be modified to add different family.

Microdyne-AFC reportedly offering to set up firms as 'distributors' for private terminal sales for $30,000 fee. This covers a demo system plus one in stock for re-sale and some spare parts.

TUNING IN THE BIRDS

BASICS FIRST

By measuring reader interest in subject matters not adequately covered in the first two editions of **CSD** one subject area easily dominated our mail-poll; the need' for reliable, accurate data describing what transponders are carrying what forms of (video) programming on what satellites. We suspect this section may ultimately become the most-read and perhaps the largest section in the Programming Edition of CSD. How well it works will depend entirely upon reader research and feedback however since there are far too many birds now operating for any single source or handful of sources to properly log and identify all of the many and varied video sources now present.

RCA SATCOM FI, FII (and FIII after launch and check out) are 24 transponder birds; as are the three COMSTAR machines. RCA and COMSTAR get 24 transponders out of a frequency assignment wide enough for 12 transponders by alternating **vertical** (all odd numbered transponders) and **horizontal** (all even numbered) 'channels'. The two **polarizations** are also offset by 20 MHz from one another. Transponder 1 is 'centered' on 3,720 MHz, transponder 3 is centered on 3,760 MHz (both vertical). Transponder 2 is centered on 3,740 MHz and transponder 4 on 3,780 MHz (both horizontal). They progress upwards to 4,160 MHz (23/vertical) and 4,180 MHz (24/horizontal) in 20 MHz steps, alternating polarizations along the way.

WESTAR I, II and III and ANIK (I, II, III and B) are 12 transponder birds; horizontal polarization **only**. For each, transponder 1 is centered on 3,720 MHz, 2 on 3,760 MHz and so on to 4,160 MHz (transponder 12). Here the step per transponder is 40 MHz.

According to theory, RCA (and COMSTAR) can group six separate downlink transponders to a single downlink antenna and they are always grouped in 6 transponder **sets** (i.e. transponders 4,8,12,16,20 and 24 feed **one** antenna array). This results in slightly different (or widely different) 'footprints' for different **sets** of transponders on RCA and COMSTAR satellites. Also according to theory, WESTAR and ANIK are supposed to have virtually the same footprint on each transponder since all 12 transponders drive the same downlink antenna (pattern). In practice there is some variation noted; up to 2 dB in severe cases.

Programming assignments, transponder useage changes monthly (weekly, daily, and hourly). It is at the option of the satellite operator that any transmissions appear on any transponders. Neither the FCC nor the DOT assign transponders; this is entirely the decision of the satellite operator. Therefore we have a very fluid system in operation.

With that background, these reported observations (published to assist you in determining with precision which satellite you are pointed at!):

STATSIONAR 4: Operational now at 14 degrees west with 6 transponders each 50 MHz wide noted. Channel centers are: (1)3,695 MHz, (2)3,745 MHz, (3)3,795 MHz, (4)3,845 MHz, (5)3,895 MHz and (6)3,945 MHz. Channels 1,4,5 carry SECAM color with 7.5 MHz subcarrier audio (off around 2 PM eastern because of time zones). In Europe 1 and 6 (no video) are the 'hot' ones, perhaps 39 dBw. Others on apparent 'global' beam at around 29 dBw (plenty hot for 10 foot dish and 150 LNA east of line from Chicago to Mobile).

COMSTAR 3: Latest ATT/GT&E bird has been noted carrying video with program audio apparently on SCPC. Apparently no regular video yet up although private video teleconferencing plus all three networks have been observed on **horizontal** transponders.

WESTAR 3: Latest Western Union bird now completing check outs from 91 degrees. Transponder 6 (13 on 24 channel radio) noted carrying CBS news feeds 5 PM eastern and UPI news feeds 6:30 PM eastern most days.

COMSTAR 2: CBS News Tokyo noted transponder 1 recently; other video on irregular basis on vertical set transponders.

WESTAR I: PBS feeds still carried transponders 8, 9 and 11 regular basis; 12 on occasions. Other video seen transponders 1, 2 and 6 occasional basis. Kup's Show originating Chicago's WMAQ noted 3 PM eastern transponder 11 recently.

ANIK B: French on transponder 8 is best signal in U.S.; English (CBC North) on 10 and 12. News feeds seen many days on 4 and 5 in 7 to 9 PM period eastern; some occasional video also on 7, primarily Friday evenings and weekends.

ANIK III: Continues to carry French transponder 8, English on 10 and 12.

SATCOM FII: Only regular video is transponder 23 Alaskan network feeds extending late into night; daytimes is video being fed into Alaska for taping and later distribution. Transponder 8 still NBC Hollywood/New York feed channel.

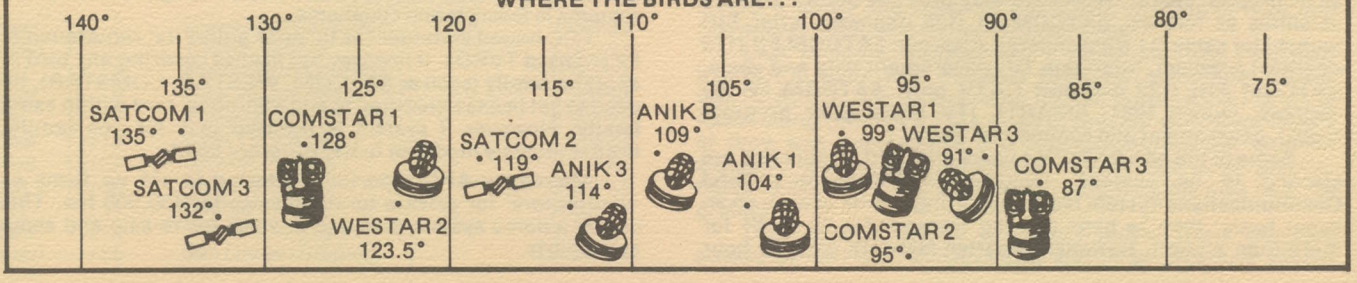
WESTAR 2: SIN (Spanish International Net) has extended operating hours to well past midnight eastern on transponder 7. Sports feeds often appear on 12 for independent network stations. News feeds transponders 1, 4 and 12 dominate in 4 to 7 PM eastern time slot.

COMSTAR 1: Only very irregular video noted, usually on vertical transponder sets. No program audio on subcarrier(s) noted.

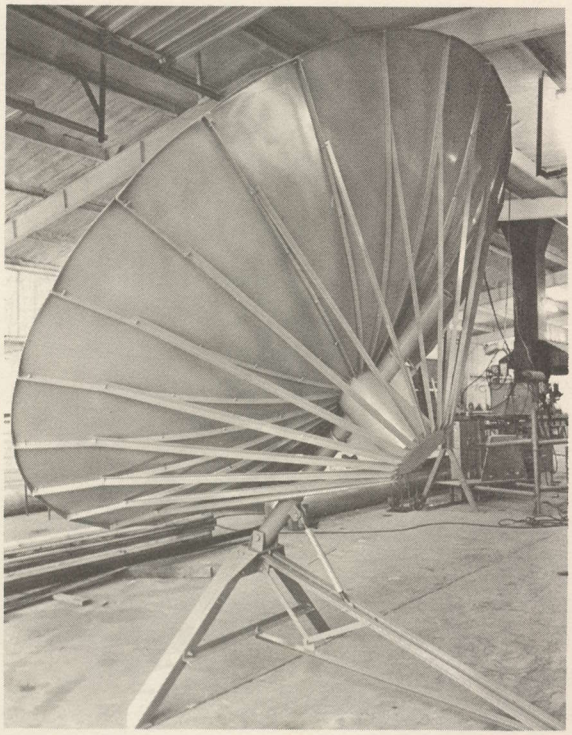
SATCOM FI: Most recent addition has been Appalachia educational program on 16 weekday daytime and Spanish language Gala-Vision on 18 evenings. See page P6 for expanded listing.

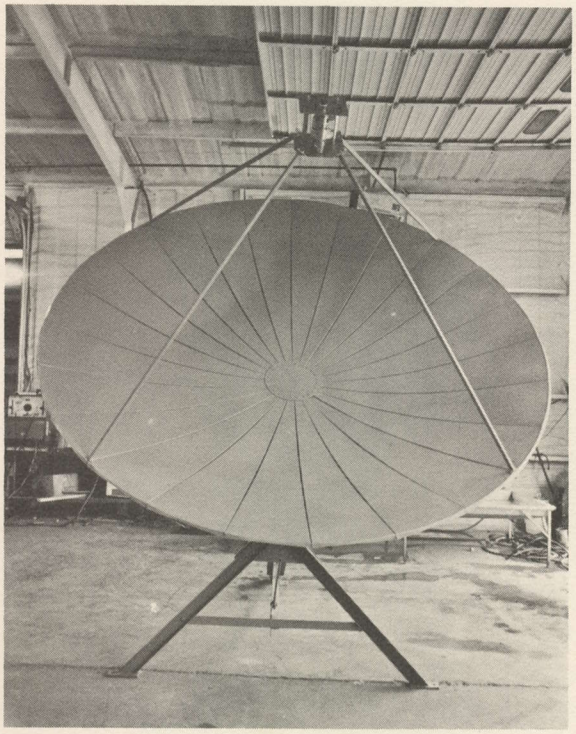
CSD welcomes reader/viewer reports and observations. Remember, occasional programs or transmissions are sent on the transponder chosen by the satellite operator and often at a time selected by the satellite operator. And any viewing of any 'private' transmissions for which you have no authority may be a violation of Section 605!

WHERE THE BIRDS ARE...



INTRODUCING: ADM's ELEVEN FOOT SATELLITE ANTENNA





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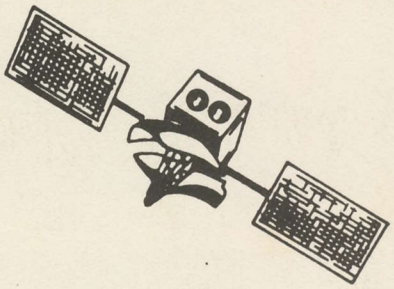

FEBRUARY 5, 6, 7
MIAMI'S BAYFRONT PARK AUDITORIUM

THE BIG EVENT! Following the same highly informative and successful format of SPTS '79, Bob Cooper opens the 1980 Satellite TV season with SPTS '80 February 5, 6 and 7 at the Bayfront Park Auditorium in Miami, Florida. Three big days of technical lectures, marketing sessions, exhibits and live satellite demonstrations all designed to bring you up to date on the fastest emerging new television technology of our time!

THE EMPHASIS IS EVERYWHERE! For the technology buff, Stanford's Taylor Howard and Robert Coleman of South Carolina have merged their talents to create a **new** single conversion super receiver for the 80's! Active GaAs-FET technology front end and mixer, combined with a new Howard-Coleman solid state 70 MHz i.f. and demodulator circuit will be shown for the first time at SPTS '80 in Miami. A truly simple, high performance receiver! **For the business person**, numerous panels dealing with the newest in commercial hardware, receive system marketing experience and the impact of the FCC's deregulation of licensing. For the system designer and engineer, 12 (twelve) H. Paul Shuch 'TVRO Symposium' sessions designed to teach you 4 GHz technology from the sky down!

FOR EVERYONE - exhibits, operating satellite terminals, satellite system videotapes and plenty of literature and hard to find satellite TV data. **FOR CARIBBEAN, CENTRAL AND SOUTH AMERICAN RESIDENTS** - two special sessions (in Spanish) detailing the reception conditions and requirements in that area of the world. **PRE-REGISTRATION IS MANDATORY!** Every indication is that this 1,000 seat auditorium will be filled to capacity with pre-registrants by the middle of January. To be sure of getting into SPTS '80/Miami, send off your registration application today. Full hotel/motel registration data will be sent to you with your confirmation.

___ **$150 PER REGISTRANT ENCLOSED.** Please rush our confirmation and the information regarding hotels and motels.

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